RAILROAD GAZETTE

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Contributions.

Car Famines.

CHICAGO, Aug. 22, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have just read your editorial article on "Railroads as Buyers," etc., giving figures and opinions as to the present and future. In the main it is all correct and true so far as I can see; but I would like to amplify on the topic of the supply of freight cars as we see that matter here.

In the first place, the prospects for business this fall are that the roads will have all they can handle, due largely to the fact that there are already in the country two large crops of grain and a third coming behind it. The farmers have not room to store the new crop, and also the better prices prevailing will have a good deal to do with the increased shipping. Those roads which run into the grain districts will naturally get the most benefit from the business, but the corn movement will be large, and the coal trade generally will be good after the strike is over.

In the matter of shortage of cars, there may be blockades at Eastern terminals where grain is handled, for the reason that the equipment of the railroads exceeds the capacity of the facilities at the seaboard for handling grain and loading vessels. Cars accumulate and block the yards at such points, which not only causes delay at the harbors, but the grain is held in the cars on railroad tracks when the cars should be returning. In this way the cars are kept out of service and cause the shortage at home. It is also expensive, because it costs more to hold grain in cars than in elevators. The facilities at the harbors for storing grain and loading vessels are not sufficient to handle the business which the railroads can deliver to them, and for this reason as long as lake navigation is open and grain is shipped by way of Chicago and the lakes, there is no trouble from a scarcity of cars. The cars which come to the Chicago elevators are unloaded and returned directly to the delivering road as long as the lake navigation is open. After lake navigation closes, in October, grain is sent east by way of other points than Chicago, and where it is transferred from western to eastern cars there is delay, but the largest part of the grain goes east in western cars, and the delay in returning the cars causes a shortage at home.

To show that it is not economical to hold grain in cars, the following figures are given: The cost of a one million bushel grain elevator is approximately $250,000. To store the same grain in cars would require about 1,250 cars which at $500 each would be $625,000. The greatest expense, however, is for the tracks and ground upon which these cars stand, and also the delays and inconvenience caused by keeping the cars out of service. The Illinois Central, for instance, after carefully considering this question, built new elevators at New Orleans, so that they do not expect any trouble from a car famine, as they can handle grain promptly at New Orleans, and thus allow the cars to return quickly.

Further, car famines are often caused by a cut rate or a low rate which is in effect for a limited period. The result is the traffic is handled in two or three months, which for the good of the railroad should be distributed over 10 or 12 months. On account of such rates and competition railroads are obliged to carry a large equipment, which during a large part of the year is idle. Where business is being handled at a low rate for a limited period, the road with the large equipment will do in a short time a whole year's business at a low rate, whereas, if they did not have the cars, they could only do a portion of the business at a low rate, and after the higher rate went into effect they would get the balance and the business would be divided up more equally. Therefore it is possible to have too large an equipment of cars. G. M.

Scciety for the Promotion of Engineering Education.

The fifth annual meeting of this society was held in Toronto, August 16, 17 and 18. Last week we gave abstracts of the address of the retiring President, Dr. Eddy, and of the papers by Dr. Mendenhall and Professor Owens. Below will be found further reports of papers and discussions, and still others will be given later.

Officers Elected.

The officers elected for the next year were: President, J. B. Johnson, Washington University; Vice-Presidents, T. C. Mendenhall, Worcester Polytechnic Institute; H. W. Tyler, Massachusetts Institute of Technology; Treasurer, J. J. Flather, Purdue Univerity, Lafayette, Ind.; Secretary, Albert Kingsbury, New Hampshire College of Agriculture and Mechanic Arts, Durham, N. H. Council, Storm Bull, University of Wisconsin; L. G. Carpenter, Colorado State Agricultural College; Albert Kingsbury, New Hampshire College of Agriculture and Mechanic Arts; F. O. Marvin, University of Kansas; R. B. Owens, University of Nebraska, R. L. Sackett, Earlham College; R. H. Thurston, Cornell University.

ABSTRACTS OF PAPERS.

Methods of Teaching, by Prof. W. H. P. Creighton.—The paper contrasts education and instruction, instancing the U. S. Naval Academy as a place where excellent education results from a minimum of instruction, and where cadets stand on merit in scholarship, where the test involves applications of lectures given rather than the lecture directly. In many difficult examinations the use of text books is allowed. Another method cited for comparison is that much in use in England, where young men enter "works" to learn engineering. The paper approves of using subjects that allow giving knowledge of useful things in addition to training. Courses of study in some subjects are often taught so that little comes of it, except a very general view of the subject. It is desirable to avoid doing too much for the student. Shops and laboratories should be used as aids to the training necessary for students.

The *Discussion* recognized the importance of adopting methods of instruction that should require solid work from students and yet have variety to maintain their interest, and also develop different qualities in them. Some question was raised as to the comparative advantages of school training first and practice afterward, or field or shop experience first and school training afterward, a subject ably discussed years ago in the time of Holley.

Teaching of Machine Design, by Prof. J. J. Flather.—The paper is not an attempt to describe an ideal method, but is rather a description of the methods used by the author in his own classes. Mechanical drawing and machine design are two different subjects, and the student should understand thoroughly the principles of projection, and be able to execute a neat working drawing before taking up machine design.

"Applied Mechanics" and "The Strength of Materials" are two subjects closely allied to machine design, and are essential to a complete mastery of the subject, but it is not essential to study these subjects before taking up machine design.

In the writer's practice the student is given a summary of the principles and general rules of calculation which are applicable to problems that may arise in the determination of machine parts, together with a discussion of the general properties of the principal materials with which the engineer has to deal, to the end that he may be equipped with suitable tools early in his work, and thus be enabled to intelligently design those simple elements of which a machine is composed. The work is carried on by means of lectures and recitations preceding each series of exercises, which latter are calculated and developed in the drawing-room, where opportunity is afforded for comment and criticism on the part of the instructor.

Individual problems are given, and the work is graded from simple riveted joints and screw fastenings, taken up in the beginning of the junior year, to the design of machinery, such as engines, small cranes, pumps and special machines during the senior year.

In all the work especial attention is directed toward familiarizing the student with practical drawing-room and shop methods, and manufacturers' catalogues and blue-prints are freely consulted for comparison and suggestion throughout the advanced work, although from the nature of the problems it is made impossible to use these as copies. The aim is to teach machine design, not drawing, and this the writer thinks is well attained in the limited time allowed for this subject by the methods deseribed in the paper.

The *Discussion* called attention to the fact that there were other important elements to be considered, aside from the strength of materials, for instance the shrinkof metals, as some designs made might be difficult or impossible to mold satisfactorily, although here the skill of the foundrymen might be an element. It was also thought desirable that mechanical engineers should understand the design of other structures than machines, such as furnaces, often necessarily designed by chemists or chemical engineers.

The Calculus for Engineering Students, by Prof. F. W. McNair.—The disciplinary and utilitarian purposes of the calculus are not antagonistic and the teacher of engineering students should keep both in mind. For either purpose the learner must be led to form definite and accurate elementary conceptions, and to reason rigorously from these to the requisite processes. The method of rates supplemented soon by that of limits affords the quickest, easiest and most natural introduction to the study. The fundamental conceptions are for the engineer the essentials, and must receive the major portion of the effort and time allowed.

Integration, the process most important to the engineer, should be treated along with the Differential Calculus, rather as an application than as a separate branch. It should be introduced by proposing and solving problems to whose solution it is necessary. From the introduction onward, practical illustrative problems from widely different sources should be freely proposed for original solution. This method of introduction and treatment should be extended, where possible, to the other topics of the calculus, since it fixes the connection between the theory and its application.

Contrary to the statement of a prominent American engineering teacher, the text-book is a minor consideration; it does not chiefly mold the habits of thought and investigation acquired by the student. It is, however, important. Its range of topics and their treatment should extend beyond the class-room requirements. It should be a work of reference for the engineer, written enabling him readily to obtain intelligent control of any needed process.

The essential object, however, is the development of the student's reasoning power.

The *Discussion* showed that many teachers appreciated the difficulty of bringing the student to readily apply his calculus intelligently, and the opinion was expressed that gain would result from having mathematics for engineering students taught by men with training in engineering rather than in pure mathematics alone. Training in Mechanics and Mathematical Physics seemed a good preparation for teachers, although men so trained prefer teaching these subjects rather than pure mathematics. It was also thought that the teacher who first presents a subject cannot be expected to make as strong an impression as the second teacher who applies this earlier training.

Metallurgy in a Mechanical Course, By Prof. M. E. Cooley.—The materials most largely used by the mechanical engineer are cast iron, cast steel and the bronzes. The strength and perfection of castings depend not only on the pattern-makar and moulder's art, but also on the mixing or founding of the metals. Modern practice has developed much skill in the manipulation of the furnace, cupola and crucible. It is becoming the practice to specify for cast metals with as much care as for wrought metals. It is not a difficult matter, with skillful workmen and an educated foundryman, to obtain castings that shall fulfill the requirements of specifications. To accomplish this the student should have a certain amount of training in the metallurgy of iron and steel and the useful bronzes. He should have enough of chemistry to enable him to pursue this study of metallurgy advantageously. It is not necessary to make of him a metallurgical engineer. That is a separate field. Five periods a week for one semester of 20 weeks (two or three hundred hours in class-room and laboratory) may be devoted to chemistry, and three hours a week for one semester of 20 weeks to metallurgy. More than this will deprive other studies of time, and unbalance the course.

The *Discussion* disclosed the opinion that the time specified in the paper was large, one third of this being thought sufficient.

Uniformity of Symbols. Special Committee, J. O Baker, Chairman.—Early in the history of the committee a series of guiding principles was adopted, and each member of the committee was appointed to prepare a preliminary report upon a division of the general subject. These guiding principles and the reports of the sub committees constitute its report.

1. Eliminate, as nearly as possible, all Greek symbols from engineering text-books.
2. Restrict the significance of each letter or symbol to a single meaning in a single subject.
3. As far as possible adhere to the usual symbols now used in engineering text-books.
4. As far as possible, Rankine's notation is to be taken as a basis for symbols to be used in mechanics.

The above was followed by reports of the members of the committee upon the special subjects submitted to them as sub-committees.

These are upon Symbols for Electrical Engineering, Mechanical Engineering; Statics, Dynamics, Hydraulics, Thermodynamics, Strength of Materials, Framed Structures, Surveying.

The *Discussion* showed differences of opinion as to the "mass" and "weight" controversy which exists between physicists and engineers, and was both spirited and good natured. Action was taken to secure a further consideration of this subject at the meeting next year.

Engineering Laboratory Courses, by Prof. R. C. Carpenter.—The following paper is intended to present a brief summary of the experiments in the field of laboratory instruction which have been conducted the last 10 years in Sibley College, Cornell University.

The laboratory of Sibley College is intended to give instruction to students in mechanical and electrical engineering in technical subjects relating to mechanical

engineering, and also to provide an opportunity for investigation and research. The laboratory, then, has two functions, one of which is purely educational, the other technical and professional. Although that feature of the laboratory which relates to investigation is one which demands the most energy on the part of the instructor and the greatest equipment on the part of the University, it will not be considered in this paper, for the reason that it is not capable of being systematized or reduced to a course of instruction, and, secondly, no individual can successfully perform investigation unless he has had a considerable previous training, both in the general theory and principle which underlies the subject and in the method of handling apparatus and making tests.

What will be stated here should be dicussed as especially referring to the conditions prevailing at this Institution (Cornell University), which may be characterized briefly as follows: First, a complete system of class instruction in which the general principles relating to the technical subjects under discussion are fully explained and exemplified. Second, a thorough system of shop training covering practice in mechanical branches of wood working, foundry work, blacksmithing and machine shop. Third, the small amount of time which is available for laboratory instruction in the regular course.

At the time of organization of the Mechanical Laboratory of Sibley College it was found that a two hours' course of instruction for junior and senior students was the longest that could be obtained without lessening the time already required for valuable studies. A two-hour course in a laboratory at Cornell University means five hours of work in the laboratory, a part of which may be devoted to the preparation of the report of the experiment. Hence the amount of time to be devoted to this subject was five hours per week during the junior and senior years. This amount of time is small, and the question at once arose as to the method which would give the student the best results and the greatest value for the minimum expenditure of time. In laying out the details of this course it was necessary to consider the special objects of the laboratory, and these may be briefly stated as follows with reference to the development of the student:

1. Practical familiarity with apparatus.
2. Opportunity to apply principles of engineering.
3. Cultivation of habit of observation.
4. Knowledge of methods of research and testing.
5. Practice in operating engines and machines.
6. Practice in describing results of investigations.
7. Preparation for research and investigation.

The number of students, the number of instructors and the amount of apparatus available should also receive serious consideration. At the time of organizing the laboratory course in Cornell University there were about 175 students ready to enter the laboratory classes, myself and one other teacher to give all the instruction and a very limited amount of apparatus available. After reviewing the ground very thoroughly it was decided that the only plan which could under the circumstances be adopted with any chance of success was to prepare a limited number of experiments to give the student minute and detailed instruction as to methods of performing the experiment, and require him to write a full and detailed account of the experiment, performing all computations required for results and conclusions. Furthermore, in order to have the experiments of most value to the student and illustrate the principles taught in the class-room it was deemed necessary to have them graded, not by individual experiment, but by groups of experiments, the experiments being so arranged that the order in any one group is entirely immaterial, but on the other hand the sequence of the groups is of vast importance.

The engineering experiments and tests are generally of such character as to require the services of two or more persons in order to conduct the test and take the necessary observations. This gave an opportunity for dividing the students into sections. A section containing two students has always been preferred to one of greater number, these sections being combined when it is necessary to have more than two observers, but it has not always been possible, on account of the large number of students and the limited number of instructors, to carry out this plan, and it has more frequently happened that our sections have consisted of three or four individuals rather than two.

Experience also taught us that a great saving of the teacher's energy could be made by separating into two periods the time allowed for the experiment, using one period for performing the experiment, taking the necessary observation, etc., and the other period for reducing the observations and writing up the results.

We have not required the student to make the manual preparations (*i. e.*, the workshops), for the experiment, except so far as drawing the necessary apparatus and arranging, attaching and adjusting it. There are many reasons for this; the first and principal one is the lack of time. A second reason is, that the student is given the necessary shop instruction and training for this kind of work in another department. A third reason is the absence of the necessary tools for the work of a considerable number of students at any time.

Regarding the nature of the experiments, these must of course be varied with the special nature of instruction and with the equipment at hand. The following table shows the experiments which were performed in the regular undergraduate course during the past year, and indicate what experiments constitute at present the course in the mechanical laboratory of Sibley College. This course is liable to be rearranged or changed as conditions are modified.

SENIOR SCHEDULE.

Fall.	*Winter.*
Hirns analysis.	Hirns analysis.
Compound engine test.	Triple exp. Corliss engine.
Injector test.	Ice machine.
Boiler test.	New York air compressor.
Governor test.	Belt test.
Rider hot air engine test.	Valve setting.
Otto gas engine test.	Ericsson hot air engine.
Oil engine test.	Nash gas engine.

Spring Term.

Thesis work and investigation.

JUNIOR SCHEDULE.

Fall.	*Winter.*
Tension test of cast iron.	Tension test of wrought iron.
Transverse.	Torsion test.
Steam gage calibration.	Steam pump test.
Indicator spring calibration.	Barrel calorimeter.
Nozzle and orifice calibration.	Separating and throttling calorimeter.
Flue gas analysis.	Boiler test.
Planimeter calibration.	Weir test.
Use of calculating instruments.	Morin dynamometer calbration.
Viscosity of lubricants.	Friction of lubricants.

JUNIOR SCHEDULE.

Spring.

Compression test.	Webber dynamometer.
Coal calorimetry	Hydraulic ram.
Thermometer calibration.	Pelton wheel.
Simple engine test.	

In the foregoing paper the writer has undertaken merely to outline the methods which have been found at least reasonably successful in the Sibley College laboratories, and to describe the peculiar conditions which led to the development of the method of instruction pursued.

No attempt is made to show that such a method would be the best to be pursued by any college under its peculiar environment. It is a method, however, which has proved to give students a large amount of instruction in practical engineering processes and methods in an extremely limited time. It is a method which is also economical of the time of the instructor and of university funds and apparatus, and in our particular case it is the result of the evolution due to the peculiar conditions mentioned.

Were the time of a student unlimited, and could an instructor devote a large amount of time, an ungraded course without specific directions might be successful, and such conditions may prevail and are, doubtless, paramount in many institutions.

Eight-Wheel Passenger Locomotive—St. Lawrence & Adirondack Railroad.

The accompanying engravings show one of three eight-wheel passenger locomotives built by the Brooks Locomotive Works for the St. Lawrence & Adirondack Railroad. These engines have many of the new features which mark the recent Brooks locomotives. The cylinders are 18 in. in diameter by 26 in. in stroke, the driving wheels 64 in. in diameter and the total weight in working order is 122,300 lbs., the weight on the drivers being 80,000 lbs.

The boiler is of the Player improved Belpaire type, in which the outside shell is reduced from a point opposite the back flue sheet toward the rear of the boiler, the top of the shell having the same slope as the crown-sheet. The distance from the crownsheet to the inside of the shell is 24 in. The material used in the boiler is Carnegie steel, and the outside diameter at the smallest ring of the barrel is 60 in. The working steam pressure is 200 lbs. per square inch. Steel angles 4 in. × 6 in. × 21 in. are riveted to the back head of the boiler to which the forged ends of the stays are joined by three 1¼-in. rivets. There are five of these stays, the middle stay being fastened by a 4-in. × 5-in. angle to the boiler shell back of the first line of riveting; the two outside stays are fastened by 4-in. × 5-in. angles to the next course forward while the intermediate stays are joined in a similar manner to the first cylinder course. The front flue sheet is stayed by four ½-in. steel gusset plates joined by angles.

The firebox is above the frames and the crown sheet has a downward slope of 5 in. from the front toward the back. The length of the firebox is 107⅝ in., the width 40⅞ in., depth at the front is 72 in, and at the back 56½ in. The firebox is constructed of Carnegie steel plates and is fitted with a brick arch supported on 2¼-in. water tubes. There are 274 tubes, 2 in. in diameter and 11 ft. 7⅛ in. long. The heating surface of the tubes is 1,646.7 sq. ft., that of the firebox 167.46 sq. ft., making a total heating surface of 1,814.16 sq. ft. The grate area is 30.4 sq. ft.

Cast steel is used for the engine truck centers, equalizer ends, spring seats, crossheads, driving boxes, piston heads and followers, frame foot plates and driving-wheel centers. Pressed steel is used for boiler fronts and doors and for cylinder head casings.

The frames are reduced back of the rear axle from a width of 4 in. to 1¼ in., while the depth is increased. The piston rods are extended out through the front cylinder heads, and the sand box is placed under the barrel of the boiler.

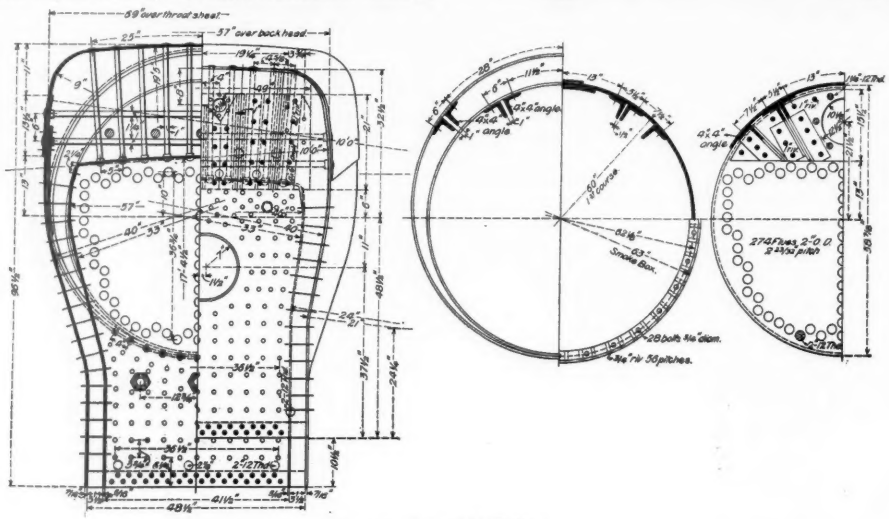
The general dimensions of the engines and the names of the makers of special equipment are as follows:

SPECIFICATIONS BROOKS EIGHT-WHEELER—ST. LAWRENCE & ADIRONDACK.

Kind of fuel to be used	Bituminous
Weight on drivers	80,000 lbs.
" " truck wheels	42,300 lbs.
" total	122,300 lbs.
" tender loaded	88,000 lbs.
Wheel base, total, of engine	23 ft. 7 in.
" " driving	8 ft. 6 in.
" " total (engine and tender)	49 ft. 3¾ in.
Length over all, engine	35 ft. 3 in.
" " " total, engine and tender	58 ft. 10 in.
Height, center of boiler above rails	8 ft. 2⅛ in.
" of stack above rails	14 ft. 6 in.
Heating surface, firebox	167.46 sq. ft.
" " tubes	1,646 7 sq. ft.
" " total	1,814.16 sq. ft.
Grate area	30.4 sq. ft.

Wheels and Journals.

Drivers, number	4
" diameter	64 in.
" material of centers	Cast steel
Truck wheels, diameter	28 in.
Journals, driving axle, size	9 × 12½ in.
" truck " "	5½ × 12 in.



Brooks Class 18A Boiler.

Main crank pin, size	5½ × 5½ in.

Cylinders.

Cylinders, diameter	18 in.
Piston stroke	26 in.
Kind of piston rod packing	Metallic
Main rod, length center to center	7 ft. 7 in.
Steam ports, length	17 in.
" " width	1¾ in.
Exhaust ports, length	17 in.
" " width	3 in.
Bridge, width	1¾ in.

Valves.

Valves, kind of	Richardson balanced slide
" greatest travel	6 in.
" outside lap	⅞ in.
" inside lap or clearance	3/16 in.
" lead in full gear	1/16 in.

Boiler.

Boiler, type of	Player Improved Belpaire
" working steam pressure	200 lbs.
" material in barrel	Carnegie steel
" thickness of material in barrel	⅝ and 11/16 in.
" diameter of barrel	60 in.
Seams, kind of horizontal	Butt jointed
" " circumferential	Double riveted
Thickness of tube sheets	½ in. back, ⅝ in. front
" crownsheet	½ in.
Crownsheet stayed with	1-in. stays
Dome, diameter	31 in.

Firebox.

Firebox, length	8 ft. 11⅝ in.
" width	3 ft. 4⅞ in.
" depth front	72 in.
" " back	56½ in.
" material	Carnegie steel
" thickness of sheets	½, ⅜ and 5/16 in.
" brick arch?	Yes
" water space, width: Front, 4 in.; sides, 3½ in.; back, 4 in.	
Grate, kind of	Shaking

Tubes.

Tubes, number	274
" material	Lap-welded charcoal iron
" outside diameter	2 in.
" length over sheets	11 ft. 7⅛ in.
Smokebox, diameter	63 in.
" length	61 in.
Exhaust nozzle, diameter	8¼ in.
" " distance of tip above center of boiler	8¼ in.
Netting	Wire
" size of mesh or perforation	2½ × 2½ in.
Stack	Straight
" least diameter	16 in.
" greatest diameter	16 in.
" height above smokebox	3 ft. 8 in.

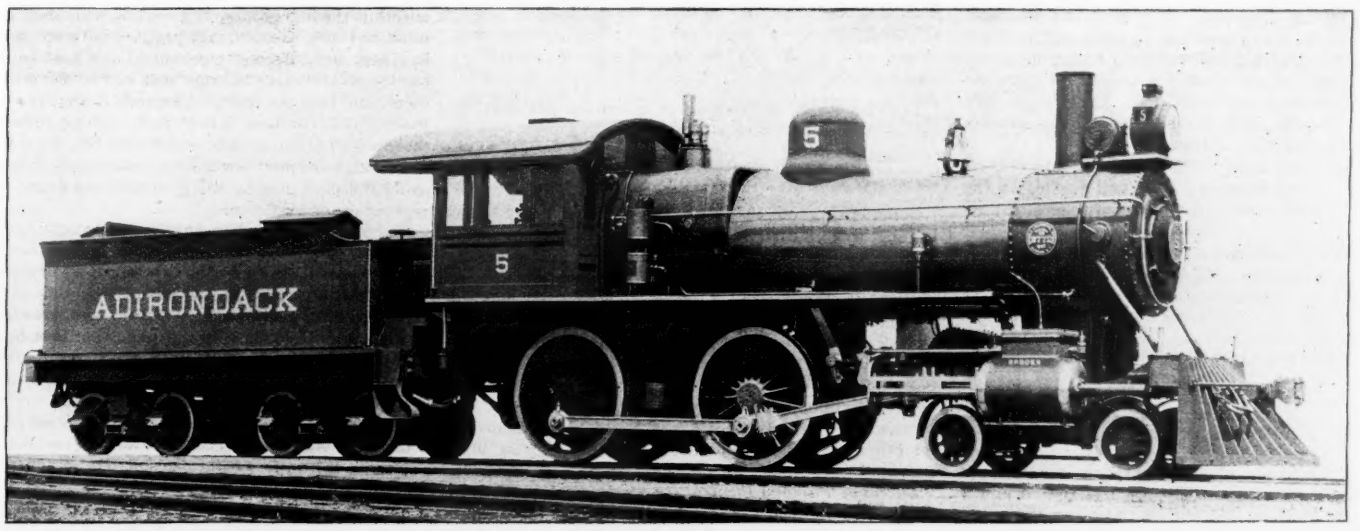
Tender.

Type	With swivel trucks
Tank capacity for water	4,200 gals.
Coal capacity	8 tons
Kind of material in tank	Tank steel
Thickness of tank sheets	¼ in.
Type of underframe	Iron
" " truck	Diamond
Truck	With rigid bolster
Type of truck spring	Double elliptic

Diameter of truck wheels	33 in.
" and length of axle journals	4¼ × 8 in.
Distance between centers of journals	5 ft.
Diameter of wheel fit on axle	5⅜ in.
" " center of axle	4¾ in.
Type of truck bolster	I-beam
Length of tender frame over bumpers	22 ft. 1¼ in.
" " tank	19 ft. 6 in.
Width of tank	8 ft. 8 in.
Height of tank, not including collar	50 in.
" " " over collar	62 in.
Type of back drawhead	Gould

Names of Makers of Special Equipment.

Driving wheel centers	Pratt & Letchworth
Truck "	Brooks cast steel
Tires	Latrobe Steel Works
Sight-feed lubricators	Nathan Mfg. Co., 1—No. 9
Front and back couplers	Gould Coupler Co.



Express Passenger Locomotive for the St. Lawrence & Adirondack Railroad—Brooks Locomotive Works.

Safety valve	Consolidated muffled
Steam heat equipment	Consolidated
Sanding devices	H. L. Leach
Injector	Nathan Mfg. Co.—Monitor No 8
Driver brake equipment	American Brake Co.
Tender "	Westinghouse Air Brake Co.
" brakebeam	National Hollow Brake Beam Co.
Air pump	Westinghouse Air Brake Co.
" governor	" " "
Steam gages	Ashcroft
Engine truck springs	A. French Spring Co.
Driving springs	" "
Tender "	" "
Piston rod packings	U. S. Metallic Pkg. Co.
Valve "	" " "
Headlights	Star Headlight Co. for two engines; Pyle-National Electric Headlight Co. for one engine.

High Carbon and Special Steels in Rails.

BY G. WHITEFIELD CHANCE, M. A., C. E.

By high carbon steel, generally speaking, I mean steel above 0.42 carbon. While the steam railroad engineer may look with favor on high carbon steel, the street railroad engineer has especial reason to view the high carbon rail with favor, as the principal fault laid against it, *i. e.*, brittleness, is not a very strong objection in street work, where the possibility of accident from a broken rail is very remote. However, the thin web and large cooling surface of the high girder rail makes it especially liable to internal stresses. The failure of girder rails, in construction work, is usually by splitting horizontally in the web, and high carbon girder rails, as now generally manufactured, cannot have the ordinary track chisel used in cutting on the web, but must be sawed entirely through. This is hardly to be counted a serious objection, however.

Harveyized and Manganese Steels.—Of special steels used in railroad work, the foremost are manganese and Harveyized. Manganese, Hadfield process steel, was introduced in this country in the manufacture of frogs and switches about three years ago, and the Harveyized steel center for frogs and switches about the same time. These special steels have been used mainly in street railroad work, as the brittleness of Harveyized steel and the uncertainty of product in manganese castings have caused apprehension as to their safety in steam road work; also the difference in character of construction of the two classes of work and cost have had much influence in the matter. Recent improvements in processes of manufacture have made these steels much more reliable.

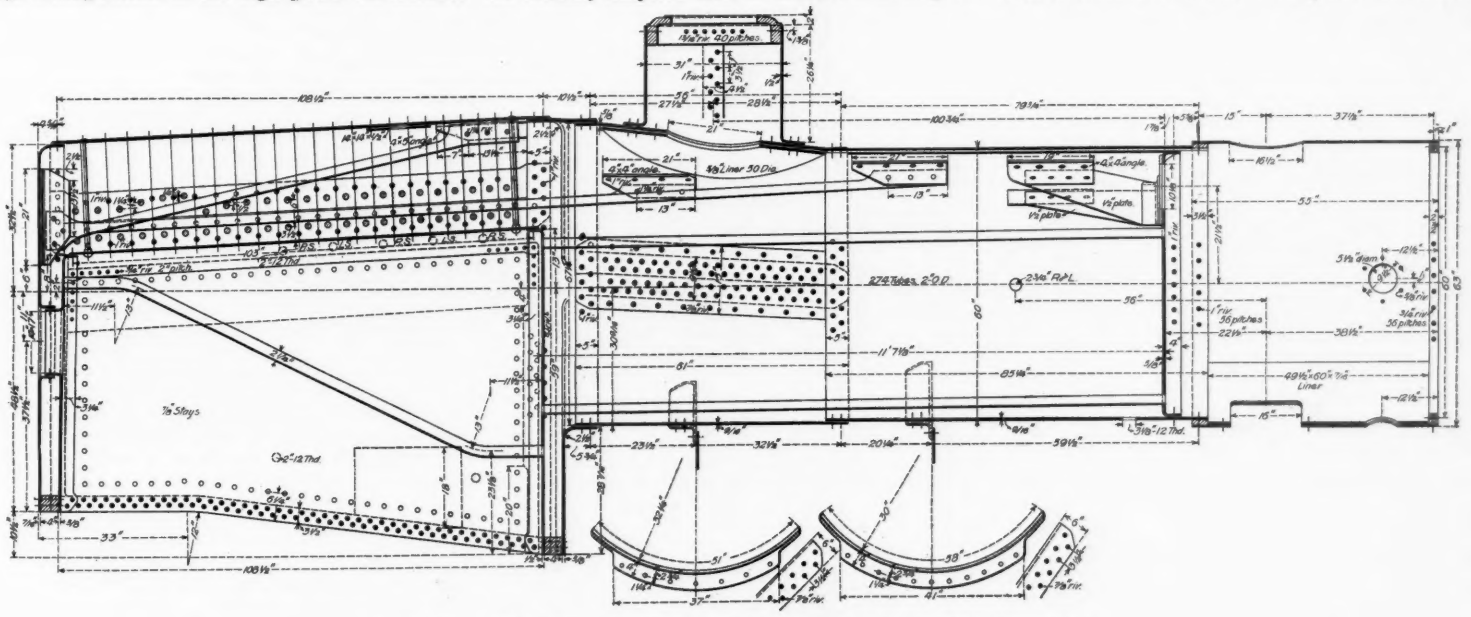
From results thus far attained, coming under the writer's observation, there is very little difference between manganese and Harveyized steel in wearing qualities when each is properly made. Either may safely be calculated to give a life of twice that of ordinary rail steel, while in some instances they have shown wearing qualities from four to five times as great as ordinary rail. The hard steel centers, as applied in street railroad practice, in frogs, are of sufficient size merely to catch the tread blow on each side of the cross-groove.

Manganese steel has been applied by the Wharton Company, of Philadelphia, to large curves, casting the rail as a flat grooved rail and resting it on cast-iron chairs. A curve of this description on the Union Traction Company's line at the foot of Market street, Philadelphia, has shown wonderful wearing qualities. The peculiar properties of manganese steel, with about 14 per cent. of manganese, seem to make it eminently fit for the use to which it has been put. The tensile strength for the forged steel is about 145,600 lbs. per square inch, with an elongation of almost 50 per cent. in 8 inches. Sudden water quenching from a white heat wonderfully increases its strength, hardness and toughness. Manganese castings shrink about five-sixteenths of an inch to the foot in cooling. No ordinary tempered drill is effective in drilling it. Cutting chisels are tempered in brine to work it. It may be cast in various forms, but thin portions in patterns and complicated patterns are objectionable, as they are apt to cause sponginess of texture in fillets and distortion or warping in the castings. Its use in street railroad work is in the cast form.

Harveyized or face carbonated steel possesses most of the good qualities for centers that manganese steel has, except that it has a tendency to brittleness that causes some spawling off of the edges; however, this is not enough marked to seriously affect its wearing qualities, and some frog centers the writer has examined have shown a wear that would challenge the best results shown with manganese centers. There has been one experiment of Harveyizing the rail head of an ordinary steam railroad frog, that has come under my personal observation, which has given good results. The frog in question was a number 10 stiff frog, made of rail of 100 lbs. to the yard section. This frog under severe main line traffic, showed a life fully twice that of an ordinary frog in the same position and when removed was in good condition, barring looseness of parts, the point and wings showing not over an eighth of an inch wear as a maximum.

Nickel Steel.—From the properties exhibited by nickel steel moderately high in carbon, one would naturally place this steel in the list of special steels of value in rail work. It has been reported that rails of nickel steel have shown excellent results in France, showing a wear many times less than ordinary rails.

High Carbon Steel Abroad.—While American engineers have in the last few years exhibited a strong tendency to high carbon in rail manufacture, since the St. Neots accident on the Great Northern Railway in England in November, 1895, there has been a strong move against high carbon rails in Great Britain. A large manufacturer in England informs me that the tendency is not to go above 0.5 carbon. The best summary of this feeling coming under the writer's notice may be obtained from the article of Thomas Andrews, in London *Engineering*, issue of April 16, of this year. Mr. Andrews, as expert, examined the broken St. Neots rail. He attributes the failure of the rail to the segregations of the sulphur and silicon constituents and to too high carbon. He says: "Rail steel as the maximum ought not to contain more than 0.40-0.42 per cent. of combined carbon." The rail that broke and caused the damage was a bullhead, original section 80 lbs. to the yard, which in this case was worn to a section of 74 lbs. to the yard. The rail had been in main line service 22 years. Analysis showed its composition as follows:



Brooks Class 18A Boiler—As Used on the St. Lawrence & Adirondack Locomotives.

Elements.	Rail head.	Rail web.	Rail bottom.
Combined carbon	0.520	0.530	0.530
Silicon	0.122	0.130	0.124
Manganese	0.450	0.410	0.350
Sulphur	0.085	0.090	0.090
Phosphorus	0.088	0.080	0.080

It should be noted that the phosphorus and sulphur are both high in this rail. Mr. Andrews makes the following suggestions for good rails: "They should be made by the Siemens open-hearth process and contain

not over 0.42 carbon. Good elongation, but not high tensile strength, should be insisted on." He concludes by saying that high carbon rails will prove brittle in the course of long service. With due respect to Mr. Andrews, it would seem a little rash to condemn all rails of high carbon because one rail after long and constant service failed.

Following the line of thought suggested by Captain Hunt in his article on the "McKenna Process,"* it would seem reasonable that the segregations that Mr. Andrews referred to were probably produced by bad heat treatment. In this connection it is perhaps well to consider whether the McKenna Process may not be looked on in the nature of a safeguard as well as a promised economy in saving renewals. It is generally conceded that metals under stress undergo fatigue, and perhaps the process of reheating and rerolling will come to the front as a means of relieving this trouble and putting the rail in a normally safe condition. Experiment has shown that the chemical composition in this process undergoes practically no alteration.

On the other hand, high carbon steel rails have been used on many of the European roads and notably on the Northwestern Railroad of Austria with excellent results.†

Hard rails have also been used in Switzerland and Russia with much success. M. Couard, Engineer of the Paris, Lyons & Mediterranean Railway, reports of French rails from four mills and German rails from five mills, the French rails wore twice as well as the German. The rails were of the following composition:

	Carbon.	Manganese.	Silicon.	Phosphorus.
French	0.86	0.69	0.15	0.05
German	0.30	0.33	0.08	0.09

M. Cazes, Engineer of the Southern Railroad of France, found 1.06 carbon rails wore nearly four and a half times as well as 0.55 carbon; however, the manganese was high in the lower carbon rail.

The Netherland State Railway Company found,‡ in the examination of a number of medium carbon and low carbon rails, that the low carbon lost 27 per cent. more than the medium carbon in 1,833 days of wear and estimate the life of the harder rails at 10 years greater than that of the low carbon. The rails weighed 68 lbs. per yard, the low carbon containing about 0.2 carbon, the medium 0.4 carbon, other elements nearly the same in both classes of rails. The International Railway Congress that met in Paris in 1889 decided hard rails to be the best for wear and safety.

French specifications call for from 96,000 to 117,000 lbs. tensile strength per square inch in rail steel. English specifications run between 69,000 and 89,000 lbs., while German average 75,000 lbs.

Capt. R.W. Hunt gives the following formulas for rail steel to be made west of the Alleghenys:§

Weight.	Carbon.	Phosphorus.	Silicon.
70 lbs	0.43 - 0.51	Not over 0.035	Not below 0.10
75 lbs	0.45 - 0.53	" " "	" " "
80 lbs	0.48 - 0.56	" " "	" " "
90 lbs	0.55 - 0.63	" " "	" " "
100 lbs	0.62 - 0.70	" " "	" " "

The Sandberg 85-lb. tee rail, recently designed for the Imperial Chinese Railways, has the following composition specified:

Carbon.	Silicon.	Manganese.	Sulphur.	Phosphorus.
0.41	0.068	0.880	0.023	0.056

The Grand Trunk Railway of Canada specifies as follows for a 65-lb. rail:

C.	Sil.	Mn.	Ph.
0.40	0.06	1.10-1.20	0.07

I herewith give Mr. P. H. Dudley's formulas of this year for rails for the New York Central & Hudson River Railroad. Rails made many years ago for the same company on specifications of Mr. Dudley have shown such excellent service and his formulas seem so rational and agree with so many high authorities that for the present we may consider them standard:

Weight of Rail per Yard.

Element.	65 lbs.	70 lbs.	75 lbs.	80 lbs.	100 lbs.
Carbon	.45-.55	.47-.57	.50-.60	.55-.65	.65-.70
Silicon	.15-.20	.15-.20	.15-.20	.15-.20	.15-.20
Manganese	1.05-1.25	1.05-1.25	1.10-1.30	1.10-1.30	1.20-1.40
Sulphur	.069	.069	.069	.069	.069
Phosphorus	.06	.06	.06	.06	.06
Rails having carbon below —will be rejected	.43	.45	.48	.53	.60
Rails having carbon above —will be rejected	.57	.59	.62	.65	.70

The following composition is given for rail steel by one of our most successful mills:

Weight of rail.	C.	Sil.	Mn.	Sul.	Ph.
65 lbs	.45-.55	.15-.20	1.05-1.25	.07	.06
100 lbs	.65-.70	.15-.20	1.20-1.40	.07	.06

Commenting on this they say "we are not only believers in high carbon steel rails, but strong advocates of high manganese and high silicon also, provided that the phosphorus be kept low." They also lay stress on heat treatment and more particularly on the shape of the rail. Another large mill advocates high carbon, but would not go over 0.55 per cent. Another large steel company says: "We think the value of high carbon has been overrated, and in more than one case there has been a reversion to the old way of medium carbons, and there have been breakages which could be explained in no other way than that the steel was of too high carbon."

Effects of Various Elements in Steel.—Carbon exists in four states in iron. It combines with iron up to seven per cent.; 4.6 per cent. of pure carbon, however, saturates pure iron. The four states are as follows:

1. Mechanically mixed, as graphite.
2. Chemically combined with the iron.
3. Chemically combined with some element in the iron.
4. In solution.

Slow cooling tends to form graphite in steel bars long exposed to high temperature. Quick cooling causes the carbon to pass into solution, rendering the steel brittle and hard, but of great tensile strength. The tensile strength of 0.5 carbon steel is about 70,000 lbs. per square inch, while that of 0.8 carbon runs as high as 150,000 lbs., after which increase of carbon decreases the tensile strength. Manganese increases the amount of carbon steel may dissolve. It also reduces the oxide of iron in the molten steel and prevents red shortness in the ingot, neutralizing the sulphur by forming sulphide of manganese. Its tendency is to make the steel hard and brittle, until the manganese gets very high, as in manganese steel, when the brittleness decreases. Manganese tends to coarse crystallization in the steel and causes the steel rail with a large percentage of it to wear rapidly. Much over one per cent. of manganese is apt to produce brittleness. The last two observations do not apply to manganese steel. Silicon, by reducing the oxides and absorbing the carbonic acid gas, stops the formation of blowholes and pipes and tends to quietness in the molds. Its tendency, however, is to very much increase the shrinkage, so that it would not seem desirable to use too large a proportion with large ingots, as it tends to produce shrinkage hollows in the central portions. Silicon tends to fine crystallization and promotes wear, but may cause brittleness. However, there are cases where it has gone as high as 0.3 without producing that effect. However, it is not advisable when rolling over three-length rails to go above 0.15 silicon.

The position that silicon occupies in rail composition is somewhat of an open question. Mr. P. H. Dudley seems to think that the good wearing qualities of the early rails was largely due to the silicon, which ran as high as from 0.30 to 0.40, with carbon at 0.25 * Sulphur prevents blowholes and pipes from welding in the rolls, and makes seamy heads and causes red shortness, Phosphorus tends to cause coarse crystallization and brittleness when the rail is cold. It acts as a hardener.

Capt R. W. Hunt, who has made a deep and critical study of the influences affecting wear in rails, lays stress on heat treatment, and cites a case where many rails of widely varied composition chemically showed excellent wearing qualities.

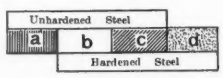
Among the conclusions of the Railroad Congress at Paris in 1889 was that in regard to the manner of producing hard rails. The opinion was that hard rails can be produced chemically or mechanically. However, this conclusion must be taken *cum grano salis*. With our present light on the subject, it would seem absurd to propose the production of water toughened manganese steel without the manganese. A certain chemical formula must be there, then we may produce different degrees of hardness by different mechanical and heat treatments or vice versa—hold the same heat and mechanical treatment, and vary the chemical formula for hardness. High heat, quick running mills, slow cooling, require high carbon for hardness, or to avoid criticism, we will say a chemical, hardener; low rolling heat, small ingots, slow mills and rapid cooling will give hardness with a medium percentage of hardener.

The form of the rail naturally materially influences hardness, as it determines the amount of work done on any particular part, and influences very markedly the rate of cooling. Dr. Wedding has shown* that a deep rail head near the top is porous and coarsely crystalline, due to slower cooling than other portions of the rail, and also to lack of work on the top of the head; he proposes to roll rails vertically, or with the head up.

Simply viewing the elements of carbon and iron in steel, the various microscopic forms in steel are: Ferrite, cementite, pearlyte and martensite.

Ferrite is iron free from carbon. It may have other impurities. Cementite is a chemical composition of iron and carbon, or it may be a double carbide of iron and manganese. It is usually represented by the formula Fe_3C. It exists in segregated masses in very hard steel; structurally free it occurs only in steel of above 0.9 carbon. Pearlyte consists of alternate plates of ferrite and cementite; it is present in large quantities in rail steel in segregated masses embedded in ferrite.

Martensite is that constituent of steel which exists at a high temperature and is retained by sudden cooling, as in quenching. Its definite composition is not known. It contains carbon from 0.12 to 0.90, and is not as hard as cementite. The condition that obtains in hardened and unhardened steel may be represented by the following diagram:



a—Pearlyte.
b—Ferrite.
c—Cementite.
d—Martensite.

By the proper study of etched rail sections it is quite possible that we may be able to predict just how a rail may be expected to wear, by observing the proportion of these constituents which are dependent both on chemical composition and heat treatment, so that the discovery of these forms in steel and their laws of occurrence again go to prove that chemical composition and heat treatment go hand in hand in the production of a good rail as much as do theory and practice in any great engineering enterprise.

Qualities of a Good Rail and How to Get Them.—1st. The head should be of a close-grained hard steel of high elastic limit, with moderate elongation and great ability to resist shock. The base and web, if possible, should be softer, but as this would undoubtedly result in internal stresses, we will be satisfied with a uniform texture. 2d. The tendency to flow of metal should be a minimum.

Chemical Composition.—To get the above qualities in the most rational way, the carbon should be high, manganese and silicon in fair proportions, and sulphur, phosphorus and other impurities down to a minimum. If the silicon or manganese goes up, the carbon must come down, when we reach the limit of brittleness: especially is this true also of phosphorus. Silicon and manganese, as ordinarily used, are not naturally

RAIL PRACTICE IN THE U. S.

Name of Road.	Carbon.	Silicon.	Manganese.	Sulphur.	Phosphorus.	Weight, Section and Remarks.
Atchison, Topeka & St. Fe Ry	Medium Carbon.					65 and 70 lbs. A. S. C. E. section, increase carbon with weight.
Boston & Albany	.60-.70	.10-.15	.80-1.00	Not over .07	Not over .06	95 lbs. Less breakages with high carbon than medium carbon.
Buffalo, Rochester & Pittsburg Ry	.55-.60	.15-.20	1.10-1.30	.069	.06	80 lbs. No greater breakages with high carbon.
Burlington, C. R. & N. Ry	.50					80 lbs.
Central Vermont R. R	.50-.60	.10-.15	.80-.90	.06	.06	75 lbs., laid in '91 and '92, best for wear ever used.
C., B. & Q. R. R	.50					75 lbs.
Chicago & Alton R. R						Buy on "guarantee."
Chicago & Eastern Ill. R. R	48-.55					No increase of breakages with high carbon.
Chicago & W. Michigan Ry	Medium Carbon.					70 lbs.
Chicago, R. I. & P. Ry	.50-.55					.80 lb., no breakages.
Cincinnati, N. O. & Texas P. Ry	.42-.47			.05	Not over .10	.75 lb., no breakages in five years.
Lehigh Valley R. R	.55-.60					80 and 90 lb. Sayre section.
Long Island R. R	.40-.60	.10-.15	.80-.90	Not over .07	Not over .095	80 lb. A. S. C. E. section.
Louisville & Nashville R. R	.45-.55					70 lb. A. S. C. E. section.
Michigan Central R. R	.50					80 lb. A. S. C. E. section.
Norfolk & Western Ry	.45-.60	.08 09	0.90-1 10	0.0-.04	.07-.08	85 lbs.
Northern Pacific Ry	.50-.60	Not less .10	Not over 1.0	Not over .05	Not over .08	72 lb. A. S. C. E. section, just commenced to use.
N. Y. C. & H. R. R. R	.65-.70	.15-.20	1.20 1.40	.069	.06	100 lb. Dudley section.
Penna. Co	Medium Carbon.					
Penn. R. R	.30-.50					
Union Pacific Ry	Medium Carbon.					
"Vandalia Line"	.40-.45					
Wabash Ry	.42-.52	Not less 0.10			Not over .10	80 lb. One year service, breakages small.
Wisconsin Central Ry	.42					
Consolidated Traction Co., Pittsburgh	.54					90 lbs.
Nassau Elec. R. R., Brooklyn	Medium Carbon.					90-lb. girder.
People's Traction Co., Phila	Not less .40					90-lb. girder.
Syracuse Rapid Transit Co	.53-.63	.10-.12	.80-1.00	Not over .07	Not over .095	90-lb. girder.
Third Avenue R. R. Co., N. Y. City	.55-.58	.061	1 08	.037	.076	106-114½-lb. girder, just put in use.

*Cassier's Magazine, May, 1897.
†*Railroad Gazette*, March 18, 1892.
‡Proc. I. C. E., Vol. CII., 1889-90.
§Proc. A. I. M. E., Oct., 1895.

* *Railroad Gazette*, Aug. 17, 1894.

* *Railroad Gazette*, March 11, 1892.

strengtheners or hardeners superior to carbon, but are to be looked on rather as the physician views the use of antidotes in medical practice. As to specific chemical formulas, I would recommend those of Mr. Dudley, given in the N. Y. C. & H. R. R. R. specifications and tabulated above.

Heat and Mechanical Treatment.—The production of good rails is much dependent on uniformity of material charged into the converter. Ingots should be made in warm molds of small size. The molds should not be stripped too hastily, as this tends to cracks. Generally 20 per cent. of the ingot top should be removed. In reheating for rolling, ingots should be kept in a vertical position and no cinder heats allowed. Overheating is one of the most prolific causes of coarse structure, poor wearing steel. Hot rolling and slow cooling produce a rail loose in structure and bad for wear. Shallow head sections lend themselves more readily to the work of the rolls and to rapid cooling, both productive of good results. It is very important in rolling that the rail or billet completely fill each pass. Spongy ingots may be caused by the the chemical reaction not being completed in the converter before pouring.

It would seem that there are two ways open for the more certain production of flawless rail steel which would also allow fast running mills, and should produce excellent rails: 1st, a modified Whitworth or hydraulic compression method for solidifying the ingot and welding the pipes and blow holes; 2d, a quenching or cooling process for the head of the rail, after leaving the saws by means of which the rail would be held in a straight position and by a suitable arrangement, the heat abstracted more rapidly from the head than from the base and sides. I do not mean by this a chilling process for the head to make it harder than the web and base, although this might be found practical, but simply a means of keeping the head at the same temperature as the web and base in cooling. By holding the rail straight until cool, very little gagging would be required and no cambreing. Gagging should be done with the blocks well apart and punching for bolt holes never allowed.

For rail sections, for present practice the American Society standards are good practice. For a 90-lb. rail the elastic limit should run about 55,000-65,000 lbs., with an ultimate strength of 85,000-95,000 lbs.

I would advise the use of test ingots, two to each heat and forged bars made from these for the ordinary bending test.

Also an occasional drop test should be used. There should be a carbon analysis for each heat, a manganese analysis for each tenth heat and a complete analysis for every 50 heats.

I herewith tabulate some information on present rail practice in this country.

In connection with this table, I will here add some further detailed information.

The A., T. & St. Fe. finds that the 50 and 52-lb. steel furnished them 8 to 10 years ago has stood better than any rail obtained since, in proportion to its weight.

This road uses the medium carbon steel, but increases the carbon with the weight of the rail.

The B., R. & P. find that high carbon steel rails are vastly superior to medium carbon rails and show greatly increased life. Breaks in these rails usually start on the bottom flange.

The B., C. R. & N. use a 0.42 carbon 66-lb. rail and a 0.50 carbon 80-lb. rail. They find these rails wear better than lower carbon.

The Central Vermont have used a 75-lb. .50-.60 carbon rail since 1891 and find it the best for wear they ever had.

The C., B. & Q. use 75-lb. rails as high as 0.65 carbon, which they find doing well. Some high silicon rails, rolled 30 years ago abroad, they have used, have done well.

The C. & E. I. use as high as 0.55 carbon. Their experience with the Bethlehem Iron Co. 56-lb. rail of 1879 has been very satisfactory. They find that it is the best rail for wear for its size they ever had.

The C,. R. I. & P. Ry., since 1893, have laid 250 miles of 80-lb. steel, some ordinary, some high carbon. The only breakage in this lot of rails was one in a 0.40-0.45 carbon rail. They find that many of the 0.40-0.45 carbon rails, laid in 1893 on double track, show battered heads and flowing of the steel. Their experience in the matter of breaks has been that the rail generally breaks square or at right angles to its length.

The C., N. O. & T. P. find that the 75 lb. rails they have used for five years vary, some flowing on the heads, others wearing well. Previous to using the 75-lb. rail, 60-lb. rail, with 0.3 carbon, was used and breakages were common. Previous to using the 60-lb. rail, 53-lb. rail was used on the Cincinnati Southern; breakages of this rail were numerous. In a lot of 53-lb. rails laid over 100 miles, breakages amounted to one rail a month; the wear was good, however, being only one sixteenth ($\frac{1}{16}$) of an inch in 12 years. The composition of this rail was as follows:

C.	Sil.	Mn.	Sul.	Ph.
0.327	0.035	1.780	0.067	0.092

The Lehigh Valley find that the rails of 20 years ago gave excellent service. The percentage of breakages is no greater with the high carbon rails they use than with ordinary rails.

The Long Island are now using the N. Y. C. & H. R. specifications. Their old trackmen think the B. I. Co. and the P. S. Co. 1881 and 1882 56-lb. rails the best for wear they ever used.

The Northern Pacific have had 66-lb 0.45-0.55 carbon steel in use two years and find less breakages than with mild steels. Their 56 and 66-lb. 0.30 carbon rails flowed much in two years' service, while high carbon rails, put in at the same time, showed no appreciable wear with the same service. The 56-lb. Bethlehem Iron Co. steel rails, laid about 15 years ago, have shown remarkable wear and done better than the 66-lb. 0.3 carbon rails.

The New York Central find high carbon rails, made according to their specifications, show increased life and less breakages than medium carbon rails. Breaks usually occur through the bolt holes.

The Wabash 80-lb. 0.42-0.52 carbon steel has been wearing well, and they have had no breakages in this rail after one year's service.

The Syracuse Rapid Transit Co. think their high carbon rails will give 40 per cent. greater life than medium carbon rails from present indications. There has been no greater percentage of breaks in their high carbon than in the ordinary rails, although they find that high carbon rails must be sawn entirely through; a chisel cannot be used.

The West End Street Railway of Boston uses high carbon rails.

Of opinions and comments on high carbon rails I have the following information: Two high authorities believe hot bed cooling defective, and one of these thinks rails are frequently injured in cold straightening. One who has given much attention to rolling mill practice thinks brittle rails are caused by segregations and piping, and that rails are finished too hot in many mills, the last opinion being concurred in by another with large experience in rail use. Another expresses the opinion that 0.60 carbon should be used in frogs and 0.50 in line rails with about 70-lb. rail, and also notes the fact that in medium carbon steel the metal flows considerably.

Another rail user thinks that 0.40 carbon 60-lb. steel is as hard as 0.50-0.55 carbon 80-lb. steel, and thinks steel for frogs should be 0.55 carbon. A street railroad official believes high carbon rails are too brittle. A large street railroad found in laying high carbon girder rails, that it had some horizontal breaks under the head and above the flange, caused by improper placing of angle plates and method of bolting up.

Wheel Mounting and its Relation to the Wheel Gage.

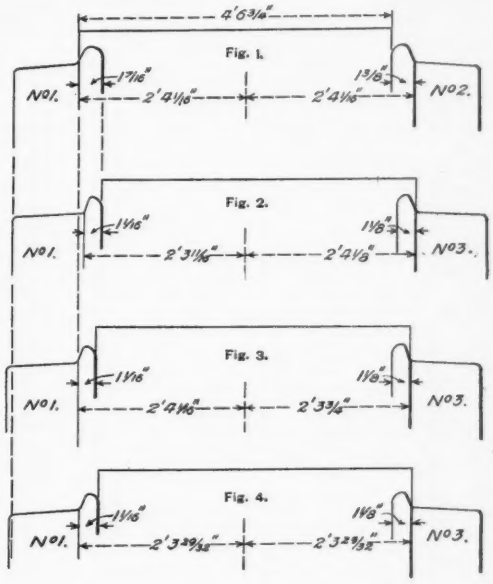
BY EDWARD GRAFSTROM.

Before the new M. C. B. code of rules takes effect on Sept. 1, attention is called to the following defect in Rule 3, which, although not of much practical importance, yet leaves an opening for misunderstandings liable to come before the Arbitration Committee.

Suppose two new wheels are mounted, as in Fig. 1, the check gage distance being measured from the inside of the one with the thinnest flange, according to M. C. B. recommended practice. If properly placed they would each measure 2 ft. $4\frac{1}{16}$ in. from the center of the axle to the wheel gage point.

Next, suppose that after a time wheel No. 2 is removed for cause, while wheel No. 1 is still in good condition, although with a flange thickness reduced to $1\frac{1}{16}$ in. This wheel may, according to the rules, be mated with a second-hand wheel, No. 3, of $1\frac{1}{8}$ in. flange thickness. The question then arises, how should this wheel be mounted? If it is merely pressed on the axle with the check gage placed against wheel No. 1, which now has the thin flange, it would come $\frac{7}{16}$ in. further away from the center than wheel No. 1. as in Fig. 2. This is apparently wrong, and no wheel maker in the country could afford to replace wheels with worn flanges under the new guarantee. if such conditions were allowed. Yet there is no safeguard against it in the code of rules, and the inspectors would have to accept cars at interchange points as long as their gages satisfy them that the check gage distance and the inside minimum distance are complied with. At first-class railroad shops it stands to reason that such work would not be tolerated, but yet, what could be done in case of foreign cars at our own shops, under these circumstances?

If a wheel with a worn flange is placed according to the mounting gage used for new wheels, that is, 2 ft. $4\frac{1}{16}$ in. from the center to the gaging point, and its mate is gaged from it by means of the check gage, the second wheel will always come further from the center in proportion as the flange of the first wheel is below the normal in thickness. A wheel with $1\frac{1}{16}$ in. flange would consequently bring its mate to 2 ft. $3\frac{3}{4}$ in. from the center. Hence it will be necessary to use a specially graduated gage in mounting second-hand wheels with worn flanges, and to mount the first wheel, or the wheel with the thinnest flange, at a distance from the center to the gaging point equal to half the sum of the check gage distance and the thickness of the thinnest flange, as in Fig. 4. This point should be clearly understood by the car shop men when mounting wheels. It is in variance with the M. C. B. recommended practice of last year, but it is the only correct method. According to the M. C. B. practice, second-hand wheels should be mounted to the standard distance between the inside of flanges. If the flange of either wheel is anything else than $1\frac{3}{8}$ in., the car can be refused by the first inspector that tries the check gage on the wheels.



Grafstrom on Mounting Wheels.

Where the wheel has a flange thickness of $1\frac{1}{16}$ in., as in the case now under consideration, it should not, according to the recommended M. C. B. practice as amended this year, be remounted. Consequently wheel No. 1 must be left on the axle where it is, as in Fig. 2, or be scrapped. If it is scrapped on a foreign road the reason *why* must be given when rendering bill for the same, but as a matter of fact there is no clause covering this instance under Rule 3 in the code, providing the wheel is otherwise sound. You remove and scrap two wheels, mount two good ones, make bill for mounting one wheel and give scrap credit for the other, thus losing $2 on the transaction.

Cases of this kind, being extreme, may be rare or may never come to light, but still there is a technical point involved which calls for an interpretation by the Arbitration Committee.

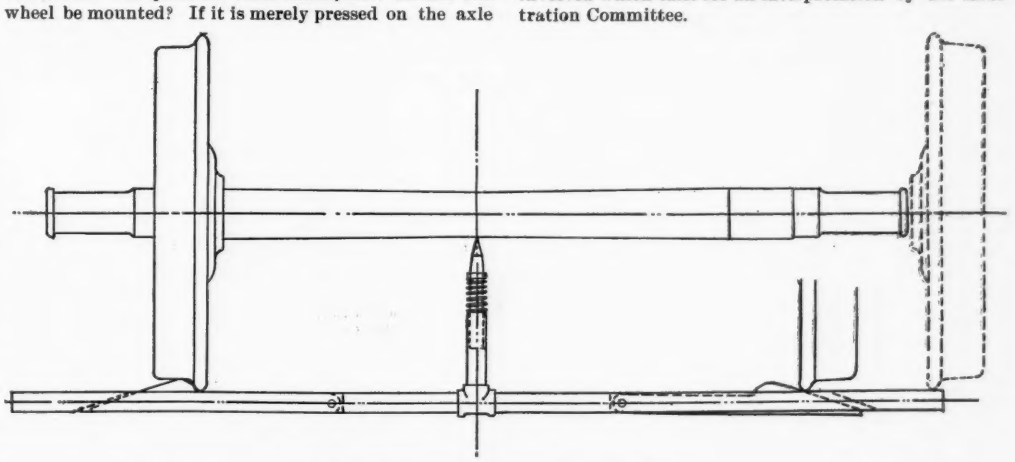


Fig. 5.—Grafstrom's Proposed Wheel Gage.

In his able paper on "The Correct Method of Gaging in Mounting Car Wheels," read before the New York Railroad Club last February, Mr. Tatnall omitted to define the relation of the track to the center of the axle, presumably taking it for granted that all the wheels are mounted equidistant from the center, measured to the inside, as seems to have been the intention with the mounting gage he proposed, as well as with the recommended M. C. B. mounting gage of last year. Mr. Tatnall's adjustable gauge will allow wheels mounted after it to tally with the check gage, which the M. C. B. inflexible standard distance between the flanges will not do. Yet the Tatnall gage is of no practical value unless supplemented with a centering attachment.

If an axle needs only one new wheel—so-called "cattails," in shop parlance—the temptation will be strong to

leave the good wheel where it is and to mount the second wheel according to the check gage. It is certainly not right; but car-owners are bound to accept it, and will probably never know how much out of center the wheels are as long as they are not out of gage. This is a weak point in the code, but it is difficult to see how it can be remedied, and those who will suffer the most from it are the wheel manufacturers, if the guarantee to replace wheels with worn flanges is insisted upon wholly or partly. As wheels out of gage will occur through the looseness of careless workmen, so also will wheels out of center be as common, although they are not reported or remedied. A variation of $\frac{1}{16}$ in. in either case does not matter much; but Fig. 2 illustrates how a pair of wheels may come $\frac{1}{16}$ in. out of center, and if the other pair of wheels under the same truck should happen to be as much out in the opposite direction, the center line of the truck would deviate $\frac{3}{8}$ in. from the center line of the track. This is an example of an extreme case, but it is permissible under the present code.

If the arguments given above are of sufficient value to be worthy of consideration, a section could undoubtedly be added to Rule 3 in the nature of a safeguard against wheels out of center, but first it would be necessary to amend the recommended practice of mounting wheels so as to produce uniformity. A gage such as suggested in Fig. 5 would perhaps give sufficiently exact results in all cases, whether with new or second-hand wheels, regardless of the variation in flange thickness. It does not give the check distance from the inside of the opposite wheel which is a variable point, but gives what is better, the distance from the center to the wheel gage point, which is after all the really most important point. If the wheel gage distance is limited to 4 ft. $8\frac{5}{16}$ in., with 4 ft. $8\frac{1}{8}$ in. as standard, it would give the same result as mounting, according to the check gage distance, besides insuring the wheels from being out of center with regard to the axle. Both wheels could be pressed on at the same time, and if proper care be exercised in stopping them when the movable piece drops home over the flange there would be no danger of encroaching upon the minimum distance between the wheels, provided they have been properly inspected for excessive flange thickness prior to mounting them. There, of course, the objection to lost motion in the joints and wear at the contact surfaces, but every competent foreman knows how to guard against that.

The present M. C. B. wheel check gage with a centering piece similar to that shown in Fig. 5 would answer the inspectors' purposes. It might, however, be necessary to locate three center points around the circumference of the axle, equal distance apart, so as to make at least one of them accesible to the inspectors.

New Coal-Handling Plant at Tacoma, Wash., Northern Pacific Railway.

The Northern Pacific Railway has recently completed a large coal-handling plant at Tacomah, Wash., which is used in transferring coal from cars to vessels, the general arrangement of the plant being shown by Fig. 1.

There are coal bunkers or bins, above which run two tracks for loaded coal cars. The coal is delivered at the bunkers in hopper bottom gondolas and openings are provided between the rails through which the coal is dumped into pockets. By means of the gates at the bottom of the pockets, shown in Fig. 2, the coal is delivered on to a conveyor running under the bins. There are two of these lateral conveyors each of which serves one-half the pockets. The lateral conveyors deliver the coal to a third conveyor running at right angles from the middle of the line of bunkers through a conduit, beneath the tracks leading to the grain elevator, and into the head-house situated on the wharf. The coal is here delivered to the discharging apron, Fig. 3, which in turn directs it into the hold of the vessel.

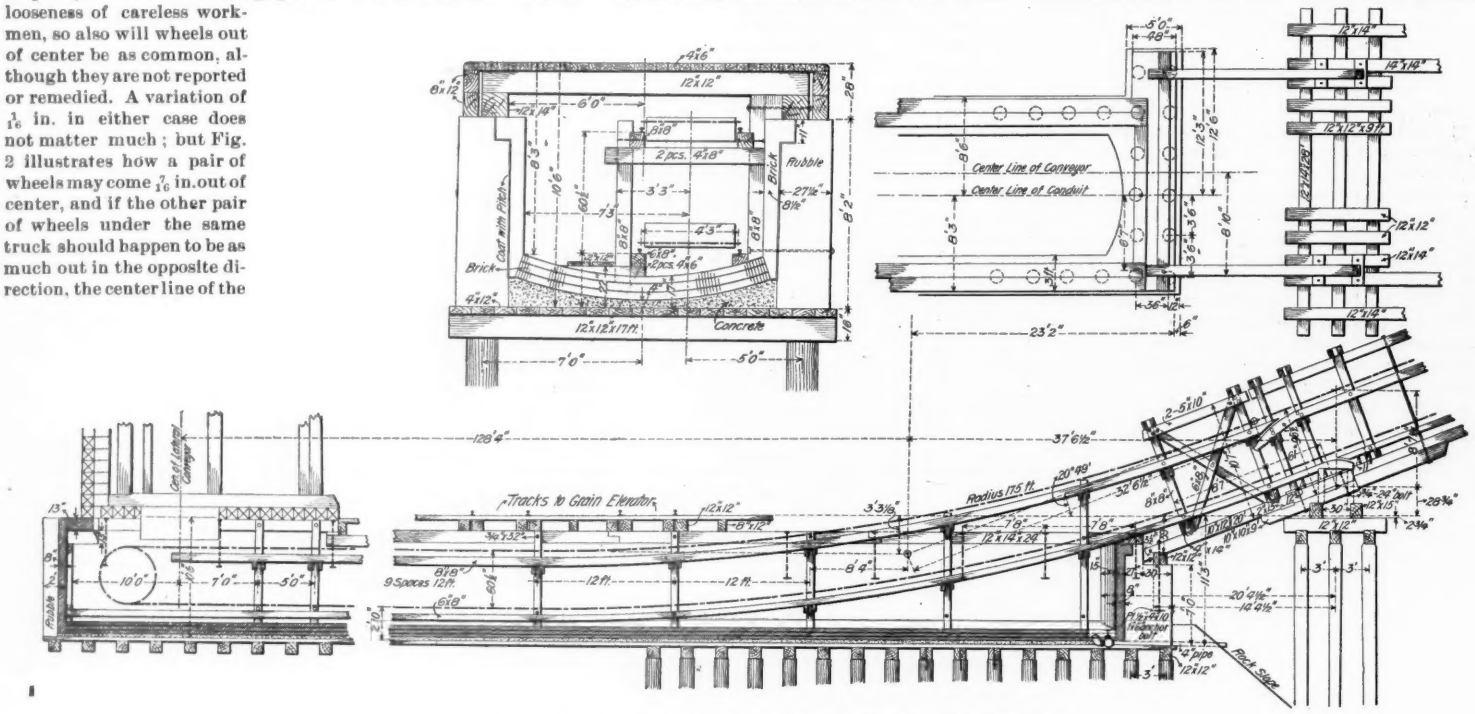


Fig. 4.—Details of Conduit at Northern Pacific Coal-Handling Plant.

The coal bunkers are built of timber and rest on pile foundations. The conduit for the sea conveyor is shown in Fig. 4, and is supported on piles driven 3 ft. apart and capped with 12-in. × 12-in. timbers, above which is laid a floor of 4-in. × 12 in. plank. The sides of the conduit are of rubble masonry lined with brick, and the floor consists of three courses of brick laid on a bed of concrete. The upper rails, upon which the rollers of the conveyor run, are supported by a timber framework, while the lower rails are laid on longitudinal timbers on the floor of the canduit. The roof of the conduit consists of 4-in. × 6-in. plank laid on 12-in × 12-in. stringers, above which are the rails of the tracks to the grain elevator.

Fig. 5 shows the framing of the bridge in the head-house, which carries the main coal conveyor. This bridge can be raised or lowered, as shown, and the discharging apron can also be raised or lowered, or adjusted in length to suit the hatchways of different vessels.

The coal bunkers have a storage capacity of 17,000 tons of coal and a maximum discharging capacity of 600 tons per hour. The conveyors and hoisting machinery were furnished by the Link-Belt Machinery Co. and the electric motors which operate the conveyors were supplied by the Westinghouse Electric & Manufacturing Co. The motors are compound wound, and a current of 500 volts is used. One 50-H. P. motor is placed at the end of the sea conveyor, and in addition to driving the conveyor, suitable friction clutches are provided, so that the motor can be used to raise and lower the hinged truss and to adjust the discharging apron. The second motor, which is 20 H. P. capacity, is placed near the coal bunkers, and operates the two lateral conveyors running under the coal pockets. By means of a friction clutch either conveyor can be used separately.

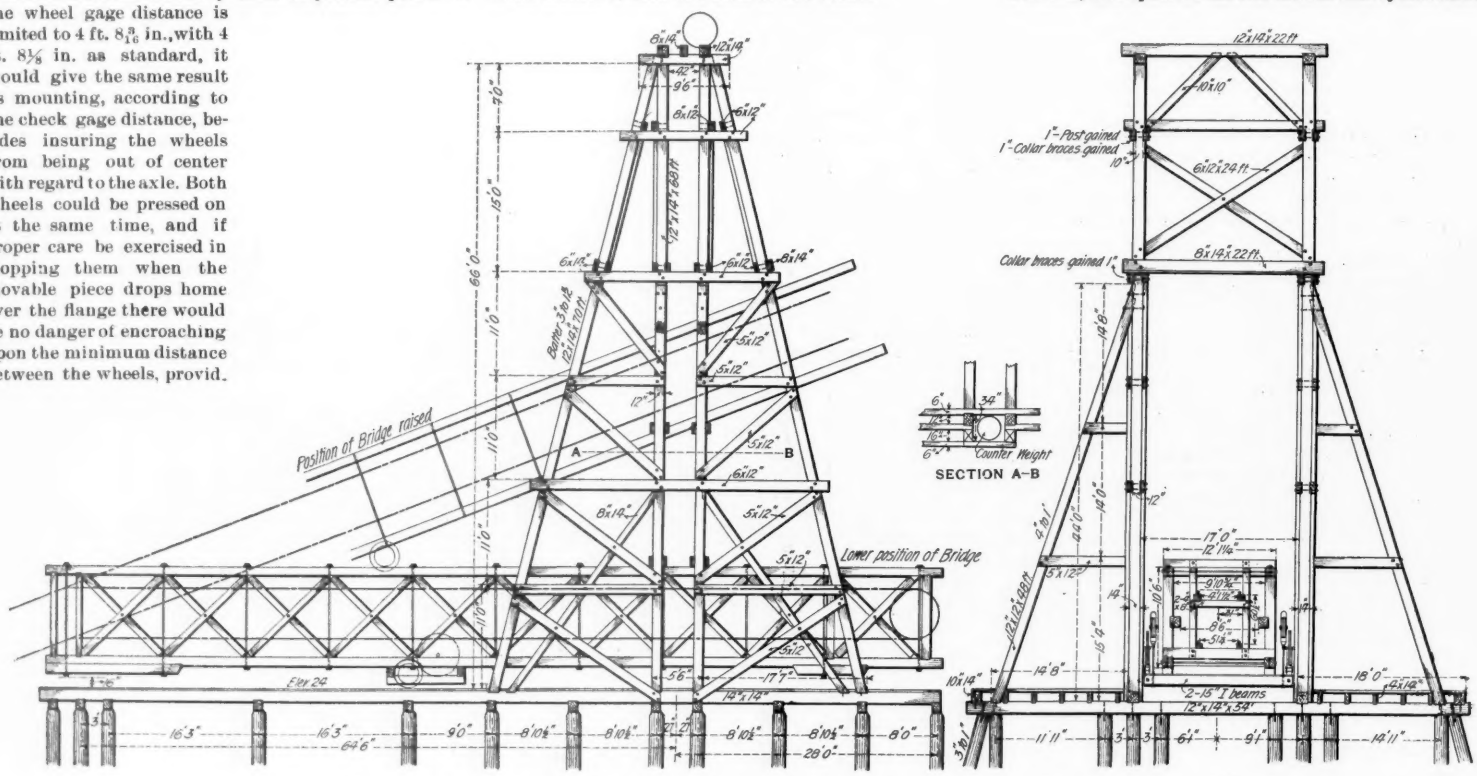


Fig. 5.—Bridge Framing in Head-House—Northern Pacific Coal Bunkers at Tacoma, Wash.

The present cost of handling coal through the bunkers is about one cent. per ton one-third of which is the cost of power.

We are indebted to Mr. E. H. McHenry, Chief Engineer of the Northern Pacific, for information and drawings.

A New Composition Brakeshoe.

Mr. A. J. Allen, Foreman of Car Repairs of the South Side Elevated Railroad, Chicago, and Mr. J. F. Morrison, Superintendent of the same road, have taken out patents for a composition brakeshoe which, from the results of service tests so far made, appears to overcome many of the objections which have been raised against composition shoes The shoe is known as the "Allen-Morrison Elastic" brakeshoe, and consists of a cast-iron shell, formed to fit the standard brakehead, which holds the composition. We are not at liberty to name all the materials of the composition, but only mineral substances are used, of which lathe turnings and mineral cements form the larger part. This material is forced into the shell under heavy pressure and is held in place by a dove-tail cast on the inside of the shell. The patents cover the composition proper, the manner of placing it in the shell and the form of the interior of the shell.

Fig. 1.—Northern Pacific Coal-Handling Plant, at Tacoma, Wash.

The composition is soft and can easily be removed with a pointed tool, but when replaced under pressure the small particles adhere to the larger mass, and there seems to be no tendency to disintegrate. The disintegration of the composition material has probably been the most serious difficulty which has arisen in connection with this type of brakeshoe.

Car No. 24 of the South Side Elevated was equipped with the new shoes on May 20, and on Aug. 10 an examination of the brakeshoes was made after running 16,066 miles; the diameter of the wheels, which have steel tires, was reduced in each case $\frac{1}{16}$ in., the wheels being 29½ in. in diameter at the commencement of the test; the composition in the shoes was 1⅞ in. thick at the beginning, and while the several shoes wore in slightly different amounts, the average wear was 1 in. The shoes were then continued in service and up to Aug. 18 had made about 18,000 miles. On this date the thickness of the composition of the shoes showing the greatest wear was ⅛ in. and of those showing the least wear the composition was ¾ in. thick, so that the expectation that these shoes will make between 22,000 and 24,000 miles is likely to be realized. The chilled cast-iron shoes which have been used on the South Side Elevated have given a service of about 18,000 miles, and the wear of chilled-iron shoes is well known to greatly exceed that of ordinary cast iron. The chilled iron shoes weigh 24 lbs. when new and 6 lbs. when worn out; the Allen-Morrison shoes weigh 21 lbs. new and 6 lbs. when no longer fit for service. Owing to the difference between the specific gravity of the chilled iron and the composition, comparisons by weight are unfair.

The service on the South Side Elevated is rather severe, the maximum speed attained between stations ranging usually from 28 to 30 miles an hour, but when trains are delayed, maximum speeds as high as 35 miles an hour between stations become necessary. The stations are so situated that an average of 2½ stops is made for each mile run, not including slowing down on curves and at other points which must be passed at reduced speed.

The same objections can be raised to these trials that apply to all service tests that, while certain phenomena are observed, it is impossible to regulate the conditions under which the tests are made, and to measure accurately any of the quantities involved. The principal things, however, which the officers of the South Side Elevated at this time care to know are how long the new shoes will wear, and if the composition will stand up under the service. These points seem to have been pretty clearly demonstrated by the results so far obtained, as this road has started to equip all its cars with the Allen-Morrison brakeshoes, and other roads in Chicago have purchased shoes presumably for the purpose of trying them in their own service.

Some of the important features of the new composition shoe are as follows: The cost of the materials entering into the composition is such that shoes can be made and sold at the same or a slightly lower price than many now on the market; the shoe does not cut or score the wheel, but imparts to it a high polish, the diameter of the tire after making 18,000 miles being reduced a little over $\frac{1}{16}$ in. with the composite shoe, and ⅛ in. with the chilled-iron shoes run the same distance; the composition fills up all small irregularities on the surface of the wheel; stops are made smoothly without chatter or jar, and there is no "screeching," which is a feature of considerable importance on elevated railroads; the wear of the shoe is at least equal to that of chilled cast iron and quite likely exceeds it by from 4,000 to 6,000 miles; the composition heats slowly.

In regard to the coefficient of friction and the variation in this coefficient at different points in the stop, no exact figures are available, but within the next few weeks it is the intention to make trials on a track not used by the regular South Side elevated trains, where a record of the speed will be taken, and where the time required to stop, the distance run after the brakes are applied and the brake cylinder pressure will all be observed. We are told (but suspect there is a grave error in the record) that by actual trials, a train equipped with the new shoes can be stopped from a speed of 30 miles an hour in about one-third the distance of a similar train fitted with chilled cast-iron shoes, and in making such stops, where the composite shoes are used a reduction of the train line pressure of about 10 lbs. is made, while with the chilled-iron shoes the reduction necessary varies from 15 to 20 lbs. This would tend to show that there is a marked difference between the coefficient of friction of the composition and the chilled iron.

We hope later to give further information regarding the trials of the Allen-Morrison brakeshoes, as the results obtained in the last few years with composition shoes show that there are possibilities for greatly improving present practice.

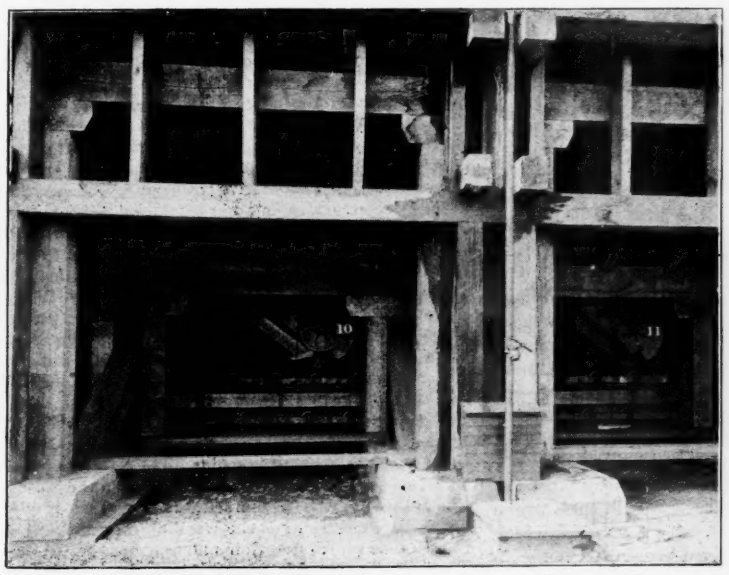


Fig. 2 —Conveyor and Gates at Bottom of Coal Pockets.

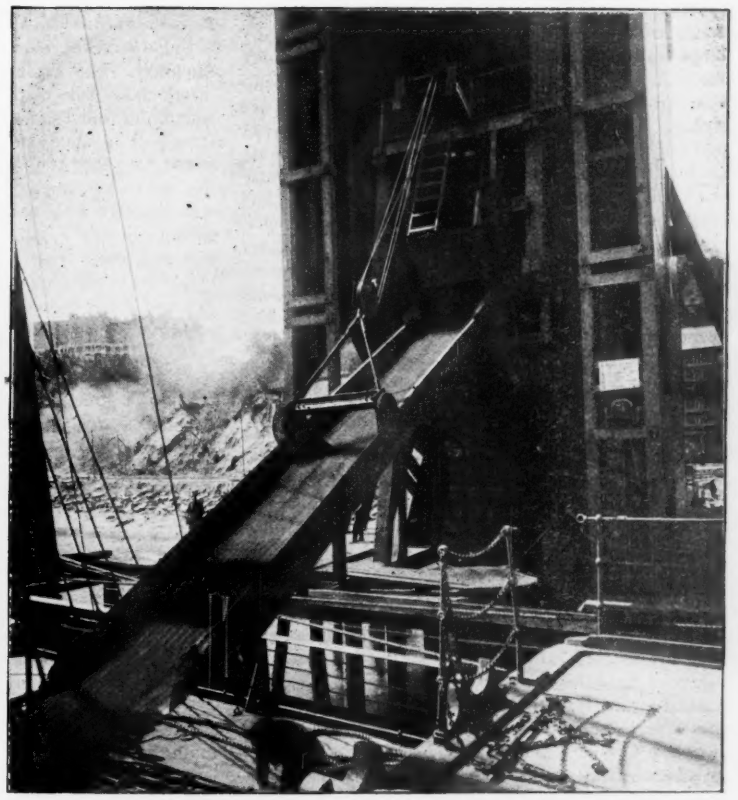


Fig. 3 —Discharging Apron at Head-House.

Brooklyn Bridge Contract Signed.

On Monday of this week the contracts were signed between the bridge trustees and the officers of the different elevated and street railroads which have their terminus at the New York and Brooklyn Bridge on the Brooklyn side. As stated in our issue two weeks since, the agreement requires the Brooklyn Elevated, the Kings County Elevated, the Brooklyn Heights, the Nassau, the Brooklyn City & Newtown and the Coney Island & Brooklyn street railroads to accept the conditions of the bridge trustees, which require, among other things, that work shall be begun on the electric roads within 10 days after the agreement is signed, and finished within six months, and the elevated roads must begin work within 60 days and be ready within a year to run their trains over the bridge. A $10,000 bond was required of the street railroad companies and a $50,000 bond from each of the elevated railroads. At first the street railroad companies could not agree as to the entrance to the bridge and in regard to the use of Sands street as the route for the return of cars to Washington street from the bridge, but they finally agreed fully to the plan as proposed by the bridge authorities, and the cars will return by Prospect street.

This is probably one of the most important transactions, as far as the development of Brooklyn is concerned, which has taken place for many years, and if the expectations of the officials of the elevated roads are realized the large increase of traffic which will result from the better service will more than pay for the additional expense. The nature of the contract is given more in detail in our issue of Aug. 13, page 570.

Iron and Steel Making in Chili.

It is stated the Chilian government has decided to appropriate $500,000 for encouraging the development of iron and steel foundries in that country. One hundred and twenty thousand dollars will be given to an American syndicate as a bonus for establishing an iron foundry, and the residue of the sum mentioned is to be similarly distributed. Government reports say that iron ore exists in abundance in Chili.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The Attorney-General of the United States has not yet given his opinion as to the meaning of the clause in the new tariff law which imposes a discriminating import duty of 10 per cent. on European or Asiatic goods coming into this country through Canada, and thus far the course of traffic seems not to have been seriously interrupted. But the opinion will, doutless, soon be forthcoming, and the long delay probably indicates that the Attorney-General, like other people, finds difficulty in putting any reasonable construction upon the clause. The only loophole thus far suggested by which the enforcement of the clause can de evaded is a provision of the Constitution that no preference shall be given to the ports of one state over those of another. The merchants of Portland, Me., have already formally protested against this embargo. As far as the railroads are concerned there does not appear to be any large traffic affected by the law except tea and silk from Japan and China, and that is not a very profitable traffic for any road. The newspapers are trying, but thus far without much success, to find out what Congressman or Senator caused the introduction of the new clause in the law. The Southern Pacific and the Great Northern railroads are accused of procuring the change, but no evidence is given to substantiate the charge. There is another change in the tariff law which may affect commercial interests much more seriously than the coming-through-Canada clause; it is the omission of a half dozen words, by which omission the 10 per cent. duty is imposed on large quantities of goods, coming by water, hitherto excepted from it. This special duty applies on all merchandise imported in foreign ships, unless it comes from countries which have been made the subject of special exceptions; these special exceptions had been extended from time to time, so that they applied to nearly all countries, but now nearly all of them have been wiped out.

There was a well-attended meeting of the Board of Control of the Joint Traffic Association last week, and the results of the meeting, as regards eastbound freight rates, are said to be harmonious, excellent, very encouraging, and the like. These cheerful assurances have to be taken, however, in the most general terms, for secret contracts with large shippers seem to have been as plentiful during the past month or two as ever they were in the most demoralized days of the past, and the only visible basis for the hopeful views now taken is the very large volume of grain moving, the consequent improvement in general business, now beginning to be manifest, and the removal of the motive to make secret reductions, which such good business furnishes. How long the present low-rate contracts on grain and provisions continue is not stated. The Board of Control did formally vote to restore the flour rate by lake and rail from St. Paul to New York to 22½ cents (the action of the Soo Line having dragged it down to 17½), and also voted to raise the rate Sept. 6 on export corn to 20 cents, Chicago to New York, this advance of five cents making the export and domestic rates equal. With the present and prospective heavy movement this advance stands a good chance of being carried out, though there is no sign yet that the Illinois Central or the other lines to the Gulf of Mexico will make any advance. Eastbound rates from St. Louis were said to be in very bad shape and another meeting was to be held this week to consider them. The most important change actually made by the Board was the withdrawal of all soliciting agents for 30 days from the territory northwest of Chicago. The lake lines join in this. In the absence of the power to pool, the temporary suspension of soliciting agents is, or ought to be, one of the most effective ways of diverting freight, and as the Joint Traffic Association was formed for the express purpose of correcting unequal distribution of traffic without violating the law, this experiment is a normal exercise of one of the association's natural functions and the outcome will be looked for with interest.

Composition Brakeshoes.

The action of the South Side Elevated Railroad, Chicago, in adopting brakeshoes made of composition material, after service tests lasting about three months, will again call attention to this class of brakeshoes. A good deal of interest has been taken in the development of composition brakeshoes, especially since the laboratory tests made by the Committee of the Master Car Builders' Association showed clearly that such shoes have some decided advantages over shoes made of a single material. At the same time these tests showed that the composition shoe had not reached such a stage of development as to make it a very serious factor in the brakeshoe industry; but there is sufficient possibility of very important results to be realized by working along this line to make it necessary that mechanical officers should keep informed as to what is doing.

Among the shoes tested by the M. C. B. Association and reported on in 1895 was one known as the "Safety" brakeshoe, which consisted of a soft cast-iron body in which wooden plugs were inserted. This shoe cannot strictly be classed as a composition brakeshoe, yet the principle upon which it was made is much the same and it was, perhaps, from this shoe that others took the idea of combining different materials, although the use of inserts is old, the Meehan shoe having been in use many years.

The 1895 report of the Committee on Road Tests of Brakeshoes shows that in the service tests the wooden plugs of the safety shoes fell out and also that the shoes cracked. The breaking of these shoes was due to the amount of metal removed to make room for the plugs. The same troubles developed when the safety shoes were tested in the laboratory, but here it was found that these shoes gave a more nearly uniform pull on the dynamometer than any of the others tested, also that the pull did not increase rapidly near the end of the stop. The mean coefficient of friction was also higher than that of the plain metal shoes, giving shorter stops than were obtained even with soft cast-iron. The "Safety," also, was the only shoe tested that year which gave a smooth stop without jar, and it has been decided that this was due to the presence of the wood. An objectionable feature, developed during the shop tests, was that where stops were made from high speeds the heat was sufficient to char the ends of the plugs.

The shoe with wooden plugs has been used quite extensively on street cars where on account of the light service the shoes do not break nor the plugs become charred, and we believe it has here given very satisfactory results. After it was ascertained that the wooden plugs were not adapted to steam railroad service the design was slightly altered and cork substituted for the wood. It has been found that the coefficient of expansion of the cork is such that the plugs do not fall out when the shoe is heated, and we have been informed that the cork is not charred so readily as the wood.

The M. C. B. Committee on Laboratory Tests of Brakeshoes presented another report in 1896 which included tests made on the Kinzer brakeshoe which is a cast-iron shell filled with a composition consisting of cast-iron borings, carbon in the form of charcoal, asbestos, resin, black lead and linseed oil. This material is put in the shells under heavy pressure and afterward the shoes are baked in a furnace at a high temperature.

These shoes when tested by the committee in the laboratory gave very surprising results. The coefficient of friction obtained was under all conditions slightly higher than that given by the soft cast-iron shoes, cast iron giving higher coefficients than any other metal. The stops were also smooth and made without jar, and the diagrams showed a very nearly uniform pull on the dynamometer, with no tendency to run up as the speed decreased near the end of the stop, which would signify that the pull on the brake hanger throughout the entire stop would be practically constant when used on a car. It was also observed that while the metal shoes became heated, in many cases to redness, for as much as one-fourth inch back from the face of the shoe, very little heat was absorbed by the composition. There was also no tendency to roughen or cut either the chilled or steel-tired test wheels, but on the other hand the irregularites in the wheel's surface after a few tests were filled with the composition, which became very highly polished.

After the Master Car Builders' tests the Kinzer composition shoes were tested in actual service on steam roads and considerable difficulty was experienced from the composition disintegrating after two or three weeks' service and falling out of the shells. We are informed, however, that changes have been made in the methods of making the shoes so that those recently put in service have not shown the same tendency to disintegrate.

The Allen-Morrison brakeshoe, deseribed on another page of this issue, which is now in use on the South Side Elevated, Chicago, shows, so far as can be determined from service tests, that the composition gives about the same uniform coefficient of friction throughout the stop that was characteristic of the composition shoes tested by the M. C. B. Committee. But one feature of the new shoe, of vital importance, is that the composition does not break down and fall out of the shells after being in service a short time.

The trials on the "Alley L" would indicate that an important improvement has been made and that composition shoes suitable for severe service are not impossibilities. It has also been shown that the wear obtained from such shoes is equal to or greater than that of chilled iron. Data now at hand would indicate that composition shoes work equally well with either steel-tired or chilled wheels, that the friction throughout the stop is nearly uniform, and there is an entire absence of the screeching common to all metal shoes. It would appear, therefore, that the composition brakeshoe has reached a point where it deserves careful consideration, especially as the Master Car Builders' tests have shown that all the common metals available for use as brakeshoes have one or more objectionable features and indicate that better results can be obtained by a combination of materials.

We believe we are only expressing the wish of those who appreciate the value of the work done by the committees on brakeshoe tests when we say that it would be desirable to have accurate information regarding the latest composition brakeshoes. The present standing committee by making sufficient laboratory and road tests would save the railroads trouble and expense in conducting individual trials, which are as a rule unsatisfactory.

Cost of Motive Power on Street Railroads.

On another page may be found a description of the essential features of the construction of the Englewood & Chicago Electric Railroad, the only storage battery road in this country. Its successful working (from a mechanical standpoint) makes it especially appropriate now to consider a way of analyzing some of the more important engineering questions in connection with the use of electricity as a motive power on street cars.

The engineer equipping a road to be worked by mechanical power is often confronted by considerations that make it difficult to decide between the different successful methods in use to-day, and the final decision is frequently determined by other considerations than the mere question of the cost of motive power. This is especially true in the case of large cities that restrict the use of different methods of construction and operation. There are, however, fundamental principles which can be pretty accurately understood, and if we suggest a line of analysis in a simple way it is with no thought of trying to exhaust the subject, or to make it appear that a general scheme can be outlined which can be followed in all cases or under all conditions. For the most part the discussion will be confined to those methods of traction where electricity is the working force.

In the forms of traction under consideration we can divide the process of the development and utilization of the power into the following heads (1) generation, (2) regeneration, (3) transmission and (4) application. In the overhead and underground trolley and in the storage battery roads we have in common the steam engine for the first, the dynamo for the second and the car motors for the fourth process; in the third process, however, the storage battery makes a radical departure. Although two chemical actions take place in the transformation of energy leading from the second to the fourth step, yet this is accomplished with a very high efficiency, and it is questionable if it can be exceeded for the transmission of electric energy in either of the other two systems unless, of course, an excessive amount of copper is used in the transmission. From the mechanical stand-

point, this possesses considerable interest and is sometimes overlooked.

For convenience we include the consideration of the return circuit under the third head. Concerning only the transmission of the current, there should not be much difference in the efficiency of the application, whether the overhead or underground trolley is used. Where the latter is used there is no necessity to bond the rails to provide for the return current, there being a rail in the conduit that answers this purpose. While the conduit construction is very expensive, yet we are led to believe that the cost of power may be a little less than with the overhead construction, taking into consideration the cost of the conductors in each case.

By following through these processes we find that as far as the question of *motive power alone* is concerned the final efficiency would come out about the same in each case. It is important to note, however, that the average amount in this item of street car working, say from 1¼ to 1½ cents per car-mile, is but about 10 per cent. of the total average operating expenses, from which it will be seen that there are other questions which may be even more important in the economical management of a street railroad than the motive power item. Of these other considerations we can undertake no examination now, but merely suggest that each item in the operating expenses can be treated in a manner similar to that by which we have endeavored to analyze but one part of the subject; and although this will not lead to final results that can be relied upon, yet it will indicate many relatively weak features in part or in all the methods of traction here considered.

It will be observed that with the cable line we pass over the second and fourth process, but in the third step we find the cost of renewals and repairs very high, and the cost of hauling the cable itself is no small item.

With compressed air we virtually pass through the four processes outlined. We start with the steam, regenerate the power in the form of compressed air, transmit it by storing the energy on the cars and applying it in the cylinders of motor. The cost of performing the different operations, the efficiency and capacity of the different machinery, can all be determined with considerable precision, and besides this the results of the trials with both the Hoadley-Knight and the Hardie motors must be regarded with some degree of interest, even by those who are very sanguine as to the final outcome of compressed air motors.

With the steam locomotive we jump over from the first to the last process, but while there is a gain in this, it should be noted that it requires perhaps over 5½ lbs. of coal to give a horse-power an hour at the rails, whereas a horse-power can be obtained for 2 lbs. of coal at the best central stations, and the losses during the transformation and transmission bring the number of pounds of coal per effective horse-power at the track to somewhere near the same figure in each case. It must be understood that we do not take these figures of 2 lbs. and 5½ lbs. as *averages*. There are no averages of coal per horse-power—the conditions are too variable. But we have taken figures that are fairly comparable.

The demand for second-class sleeping car privileges in this country, except for the long and costly journeys west of the Missouri River, has always been of a very doubtful character, if indeed it has existed at all. A transcontinental car has been run through from Boston or New York on a regular weekly schedule, and, we believe, one or two such are running now, but no one is enthusiastic over the business. Dissatisfaction with the high rates on the standard sleeping cars is, indeed, often enough expressed, and there is little doubt that the principal difficulty with second-class cars—the difficulty of maintaining cleanliness and agreeable surroundings—could be measurably overcome; yet the cars have not become popular. But the passenger agents are continually awake to all possible schemes that will promise an increase of business, and the tourist sleeper is not likely to fail to find its mission by reason of any lack of attention from them, and we have to note to-day the announcement by the Pennsylvania, and also one by the Baltimore & Ohio, of regular tourist sleepers from Pittsburgh to the Pacific Coast. Each of these roads expects to put on one or more lines about Oct. 1. The Pennsylvania proposes four, as follows: Between Pittsburgh and San Francisco, via Chicago and the Burlington and its connections; between Pittsburgh and Portland, via Chicago and Chicago, Milwaukee & St. Paul between Pittsburgh and San Francisco, over the Vandalia line, via St. Louis, and in connection with the Missouri Pacific; between Pittsburgh and Los Angeles, Cal., via Cincinnati and the Louisville & Nashville, in connection with the Southern Pacific, via New Orleans. The Baltimore & Ohio, so far as we have observed, has as yet announced only one route, that via Louisville, the Illinois Central and New Orleans. All of the lines will, presumably, be run once a week, or at least very much less frequently than once a day. Of course the trans-continental business cannot be sufficient to support so many cars east of the Missouri River, and it is, therefore, reasonable to assume that the experiment is made largely for the purposes of seeing what field there is for these cars in the Central States.

Mr. Charles Hansel, General Manager of the National Switch & Signal Company, Easton, Pa., has reprinted in pamphlet form his paper on "State Supervision of Grade Crossings," which appeared some time ago in the *Railway Age*. Mr. Hansel had a hand in framing the law on this subject which prevails in Illinois, and he issues this pamphlet to answer questions on the subject which he receives from other states. He quotes this law in full, also the Ohio law (of April 27, 1896), which deals with street (electric) railroad crossings as well as those of standard railroads. The Illinois law has a proviso that every junction shall be deemed a crossing, within the meaning of the act, whether the several tracks are owned by different companies or all by one. If consistency is to be preserved this, of course, is necessary. If we admit the theory that the lives of passengers need the protection of a State Board of Commissioners, we must recognize that the protection may be needed at a junction or in a yard as much as at country crossings. Mr. Hansel says that the Illinois Commissioners have exercised their powers with wisdom and moderation, so that the law "seems to meet with general approval." Such a result is matter for congratulation, for without reasonable minded and well qualified commissioners no signal law would be possible; to prescribe details by statute would be out of the question. Mr. Hansel's pamphlet also contains an argument for the use of derailers and electric locking, which appeared in the editorial columns of the New York *Sun* after the Atlantic City disaster last year, an editorial which is far too intelligent to be credited to any "staff writer." It must have been written by a railroad or signal engineer.

The Attorney-General of Kansas has filed a bill at Emporia against the Missouri, Kansas & Texas, and the Missouri Pacific, and at Newton against the Atchison, Topeka & Santa Fe, asking for an injunction restraining them from enforcing the new live stock rates, which are based on the unit of 100 lbs. instead of the carload. This question of the weight of a carload of cattle seems to make a prodigious amount of bother in Missouri and Kansas. A few years ago the cattle-men of the former state claimed to have been greatly abused by the enforcement of charges on actual weights. The Kansas men, according to a recent Omaha report, had got the railroads to charge by weight instead of collecting a lump sum for a carload and had "got what they wanted." But evidently the Omaha reporter got the story twisted; the shippers got just what they did not want; and now they persuade the State Railroad Commissioners that they are suffering injustice. The real trouble is, no doubt, that in charging by the carload the railroads have constantly underestimated the weight, and have charged too little, and this abnormally low price is now looked upon by the shippers, with perfect honesty, as the normal and reasonable price. But even if the railroads have to yield to this claim and reduce their rates, it will probably be well in the end; the price should bear a true proportion to the weight, whether the rate be high or low; and it never will as long as the crude carload rate prevails.

Among the numerous fast runs recently made there appears to be one which did not get promptly reported. It was on the Pittsburgh, Fort Wayne & Chicago, on July 16, and though it may not break many records it is worthy of note, even when six weeks old. On the day named the westbound New York & Chicago limited, six cars, made up 59 minutes between Fort Wayne and Chicago, running 148.3 miles in 171 minutes, or at the average rate of 52 miles an hour. The time to be deducted for stops and reductions of speed is 24 minutes, making the net speed 60.5 miles an hour. From G. R. & I. Junction to Colehour, 132.5 miles, the time was 131 minutes, equal to 60.7 miles an hour; from Hamlet to Colehour, 55.4 miles, 50 minutes, rate 66.5; Wheeler to Hobart, 3.7 miles, 3 minutes, rate 74. The train was run from Plymouth to Chicago, 84 miles, without taking water. The engine was No. 147, and it was manned by Engineer Hebert and Fireman Barber. The weight of the train was 628,587 lbs. Of the trains which have heretofore made as fast time as this for such long distances, few, if any, have been so heavy. Lighter trains have made better time, and heavier trains have made records approaching this, but we find no record in which so heavy a train was run so far at such high speed.

The New York merchants now state that the total number of buyers that came to New York on the first special-rate excursion was 1,200. The second excursion begins this week. The officers of the Merchants' Association are greatly grieved because the roads of the Southern Passenger Association will make no reduction for merchants. The Norfolk & Western, the Richmond, Fredericksburgh & Potomac and the Old Dominion Steamship Line have, however, made reductions for passengers coming to New York, as desired by the merchants. Chicago and St. Louis are boasting of the prosperity brought to their respective cities by merchants coming on reduced-rate tickets, and the tone of their exultation seems to be every whit as joyful as that of the New Yorkers. The St. Louis papers say that prosperity is coming into that city by the carload, "the merchants of the South and Southwest find better prices and more suitable stocks in St. Louis than anywhere else." The Chicago *Times-Herald* estimated last week that the buyers visiting that city had left about $5,000,000 behind them. New Orleans has had excursions from points on the Southern Pacific and the Texas & Pacific. Where a merchant buys $1,000 worth of goods the New Orleans Trade Committee pays his fare.

Judge Clark, in the United States Court at Chattanooga, has granted a permanent injunction against the 27 ticket scalpers of Nashville, as asked for by the railroads. The judge, in his decision, recognizes the disreputable character of much of the business done by ticket brokers, rehearsing the evidence presented at the trial concerning pasting of tickets, alteration of dates by acids and by punch manipulations, etc. He follows the time-honored rule of declining to specify why he grants the injunction; an equity court is a law unto itself. Each railroad is required to give a bond of $20,000. The injunction applies only to iron-clad exposition tickets which have been signed by the original purchaser in ink.

NEW PUBLICATIONS.

Rapalje & Mack's Digest of Railway Law. Volume VII. Edward Thompson Co., Law Publishers, Northport, Long Island, N. Y.

The seventh volume of this admirable digest of railroad decisions is before us. The topics covered are from Recitals to Trestles, both inclusive. Among the more interesting subjects digested are Removal of Causes, Reorganization, Sleeping Car Companies, Specific Performance, State Aid, Station Agents, Stations and Depots, Statutes, Stockholders, Street Railroads, Streets and Highways, Strikes, Subscriptions to Stock, Taxation, Tickets and Fares, Trespass and Trespassers.

A number of these titles occupy less space in this volume than in the ordinary digest for the obvious reason that this is a digest of railroad decisions and, therefore, the titles are digested only in so far as they relate to the law of railroads.

The digest of cases on Reorganization is interesting as embracing a subject more or less familiar to those dealing with railroads, but frequently absent from the ordinary digest. The subject is considered from the standpoint of the validity of schemes for reorganization, reorganization by legislative act, sale by purchasers to existing corporations, rights and remedies of stockholders, payments on account of stock, cancellation of unpaid subscription, rights of bondholders including deposits of bonds, right to account, rights of non-assenting bondholders, rights of creditors, rights of pior mortgagees, legal status of new corporation, liability for debts of old company, for its torts, for expenses of reorganization, for value of land taken by old company, for state taxes, setting aside reorganization and English schemes of arrangement. This brief synopsis shows what rich fields there are for legal investigation furnished at hand by this volume.

Sleeping and Palace Car Companies embrace the subject in general and duties and liabilities to passengers and the liability of the railroad company. The subject State Aid embraces decisions in Alabama, Arkansas, California, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Minnesota, Mississippi, Missouri, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas and Virginia. Stations and Depots will be found to embrace some very interesting and important subjects. It covers: interpretation of words, establishment and location, including the power to locate; duty to locate as affected by contract, abandonment and re-location, rules of the company and injuries caused by negligence. Stock and Stockholders include a variety of decisions which cannot be obtained in the same space in any other volume that we know of.

Street Railroads occupy nearly 200 pages and there are over 532 sub-topics. It embraces: right to construct and operate, construction of charters, conditions annexed to grants, construction and repair of track or streets, rights of abutting owners, joint use of tracks, regulation of use by public authority, taxation and assessment, powers, duties and liabilities as respects the management of the road. To the cognate subject, Streets and Highways, from the railroad standpoint, almost as much space is given. The cases are very numerous and the collation seems to be exhaustive.

The digest of Strikes seems to be meagre, particularly that portion relating to the restraints upon strikes and boycotts by courts of equity. This topic should have been more thoroughly worked up in view of the Chicago platform and the great public interest in the subject at the present time.

Subscription to Stock seems to be very fully treated, but the difference between the stock of railroads and other corporations is not sufficient to make the especial digest from the railroad standpoint particularly valuable.

Taxation is most admirably digested. This ever-important subject receives attention in this volume adequate to the subject. It embraces nearly 200 pages, with 403 sub-topics, many of which cover a large number of separate decisions. Starting out with a number of cross-references, from which the subject may be investigated collaterally, the authors consider it under heads of: power to tax, constitutionality of statutes, interpretation of tax laws, who may be taxed and for what property, situs of property for taxation exemptions, assessment and levy, collection, sale of lands for non-payment and tax titles, remedies for unlawful taxation, English poor rates and other rates, taxation of Canadian railroads, license and income taxes.

Tickets and Fares are full of interesting and important cases almost impossible to be found elsewhere. On the whole this volume is quite up to the standard of its predecessors, which is saying a great deal.

Annual Report of the City Engineer of the City of Providence, R. I., 1896.—Mr. Shedd's annual report is not merely of local interest, but contains a good deal of information of interest and value to engineers every-

where. For instance, in the extended meteorological tables is one showing the rainfall, month by month, for 64 years. A description is given of the new sewage dumping station recently completed. Another fine engineering work is the new Exchange bridge, which is also briefly described.

Toronto Meeting of the British Association for the Advancement of Science.

The number of papers especially interesting to railroad engineers at the Toronto meeting was much less than at the meeting of the A. A. A. S. at Detroit. It is said that the interest in the mechanical section has abated because of the diversion of members to the more technical societies in England. Very much the same thing has happened in this country. A few abstracts follow:

The Present Tendencies of Electric Tramway Traction. By J. G. W. Aldridge, A. M. Inst. C. E.

The United Kingdom has practically 130 miles of electric tramway at work or under construction. Of this length 103½ miles are worked by means of the overhead wire, 15¾ miles by means of the third rail conductor, 6 miles by means of storage batteries and only 4 miles on the electric conduit method. These proportions may be taken as fairly representative of other countries also, as far as can be ascertained. They seem likely to be maintained or even increased in favor of the overhead wire unless radical improvements can be made in the direction of a cheaply built and maintained conduit method, or more durable and light accumulators for placing direct upon the car. Objections to the overhead wire system are almost entirely æsthetic, but at the same time have such great weight and force that every incentive is offered to the genius of invention to make improvements in other directions.

The ordinary underground conduit with open slot is most expensive to install and troublesome to maintain efficiently; it cannot be built for less than £10,000 or £12,000 per mile. Closed conduits with surface contacts usually operated by means of electro-magnetic switching devices in boxes under the street level are complicated, and it is to be feared are unreliable. The great weight of lead required on each car for accumulator traction means practically that the live paying load can never reach 25 per cent. of the gross weight of loaded car, while the combinations of trolley wires and battery, attempted on roads like those of Hanover and Dresden, are obviously ill-designed, the dead weight of battery being carried throughout the entire journey, though it is only required for part thereof. The overhead wire therefore appears likely to come into still greater use than has already been the case, if only on the ground of economy; but in view of its admitted defects the author has worked out an alternative method which avoids the erection of trolley wires along the streets above the tracks. Mr. Aldrich's plan dispenses with the overhead wire. A wire is strethed over the car from end to end, which takes the electricity from the bracket of the poles in passing. As it passes each pole the circuit is completed by contact with a stud underneath the car, and is broken when the car passes over the stud. There are no switches underneath, the switching being all done from the poles. In discussing the paper Professor Ayrton commented favorably on the plan as presented by the diagram shown.

Mr. G. C. Cunningham, of Montreal, read a paper descriptive of the electric roads in that city, in which he emphasized the importance of economy in working which is secured by means of a carefully built and well arranged power-house. The cost of operating at Montreal, notwithstanding the hilly nature of the city, is thus reduced to less than one cent per car-mile, being not much, if any, more than at Brooklyn, and less than the figure given by the Consolidated Traction Co. of Jersey City.

The following items were presented:

Coal consumed per car mile	7 lbs.
" " " ton mile	1 lb.
" " " E. H. P.	2.75 lbs.
Power consumed per motor car mile	2,000 Watt-hours
" " " ton mile	293 lbs.
Resistance to haulage per ton	147 lbs.

The use of condensing engines is believed to give considerable economy, as they give results with 2.60 lbs. of coal, equal to non condensing engines with 3.67 lbs. Green economizers bring the temperature of feed water to 250 deg. What otherwise would be cold water is introduced at a pressure of 15 lbs., giving an obvious advantage.

A New Apparatus for Studying the Rate of condensation of Steam on Metal Surface at Different Temperatures and Pressures. By Prof. H. L. Callendar and J. T. Nicolson, of McGill University, Montreal.

As the result of some experiments by electrical methods on the measurement of the temperature changes of the walls and steam in the cylinder of a working steam-engine, which were made at the McDonald Engineering Building of McGill University in the summer of 1895, the authors arrived at the conclusion that the well-known phenomena of cylinder condensation could be explained, and the amount of condensation in many cases predicted, from a knowledge of the indicator card, on the hypothesis that the rate of condensation of steam, though very great, was not infinite, but finite and measureable. The authors have endeavored to measure the rate of condensation of steam under different conditions by a new and entirely different method, with a view to verify the results of their previous work, and also to estimate the probable effect of wetness or superheating of the steam, and the influence, if any, of the film of water adhering to the walls of the cylinder. The apparatus, which was described, has been and is now being used at the McDonald Engineering Building, McGill University, Montreal.

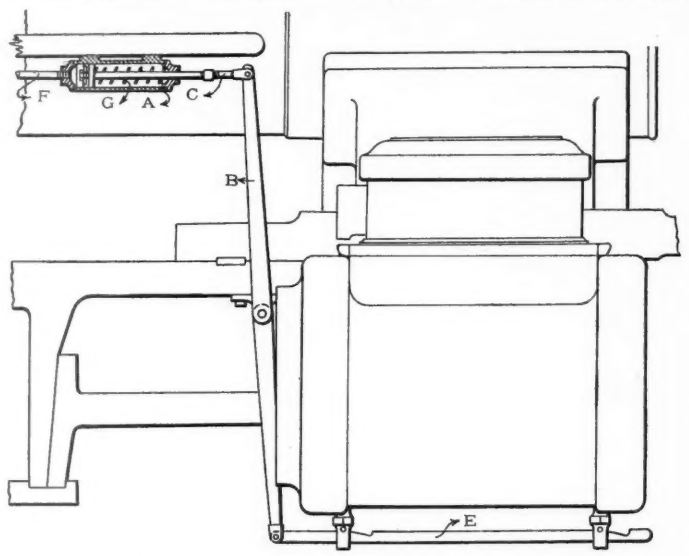
A paper of considerable importance was presented by Prof. J. L. W. Gill, of McGill University, on "A New Method of Measuring Hysteresis in Iron," an abstract of which will be given later.

The Committee on Screw Gage asked to be reappointed with a grant of £20, including the £10 granted last year, but not drawn. Their work thus far has not been carried far enough to insure practical results.

Prof. W. E. Ayerton, of the Central Institution, in London, read a paper prepared by one of his students on the subject of "Electric Meters." The fact was brought out that electric meters are subject to several influences which impair their accuracy; mere temperature changes will affect some of them, while a magnet held near others will interfere with their operations. It is possible to take current from a supply wire and store it in an accumulator without making a record, if a certain type be used, and through neglect to properly attend to the instruments, there is a chance that the meter will register backward and show the supply company to be in debt to the consumer. The most approved forms of electric meters in England cost about $25, and there is a demand for one that will do the work as well and sell for one-third or one-quarter of that sum. Already electric meters register more accurately than gas meters, but there is much room for improvement.

Pneumatic Apparatus for Operating Locomotive Cylinder Cocks.

In this device the air cylinder *A* is placed underneath the running board attached to the back cylinder head casing, or it may be located at any other convenient point. If placed underneath the running board it may be connected to vertical cylinder cock lever *B*, as shown on print. If secured to back cylinder head casing, piston *C* is coupled direct to cylinder cock rod *E*. A quarter-inch pipe is run from cylinder *A* to an ordinary quarter-inch operating cock such as is used on auxiliary reservoirs, this cock being located in the cab within easy reach of the engineman. The spring *G* operates to hold the cylinder cocks open, and as it requires a pressure of, say, 65 lbs. to compress the spring, the cylinder cock will open should the pressure in the main reservoir fall below that amount, thus indicating to the engineman that the pressure in the brake apparatus is becoming low. The reduction of pressure takes place on account of the pumps stopping, or because of leaks or too frequent application of the brakes. As the cylinder cock opens automatically when the pressure falls below 65 lbs., the risk of cylinders bursting during freezing weather is entirely obviated. It should also be noted that as the air pressure must be, say 65 lbs., before cylinder cock can be shut, and as most locomotive throttles leak more or less, the engines cannot be rushed out of the roundhouse with cylinders full of water; and even if they should have the necessary air pressure to shut the cocks, the water in the steam cylinders will have practically been blown out while the engine is generating enough steam to pump the air pressure up to 65 lbs. The patents on this device are owned by J. W. Thomas, Jr., Assistant General Manager, and Otto Best, Air-Brake Inspector, both of the Nashville, Chattanooga & St. Louis Railway.



Pneumatic Device for Operating Locomotive Cylinder Cocks.

The New England Roadmasters' Convention.

The New England Roadmasters' Association held its fifteenth annual convention at the Revere House, Boston, on the 18th and 19th inst., President R. Hyland in the chair, with a large attendance. The first day three sessions were held and one on the second. The members of the convention and the ladies of the party, by invitation of the West End Railway, on the 18th enjoyed a ride through the nearly completed section of the subway, and afterward, by invitation of the supply men, went on a steamer excursion to Bass Point, where a fish dinner was served.

The convention elected officers as follows: President, Samuel Greer (N. Y., N. H. & H.), Westfield, Mass.; Vice-President, J. M. Torr (N. Y., N. H. & H.), Woonsocket, R. I.; Secretary and Treasurer, F. C. Stowell (B & M.), Ware, Mass. Executive Committee: W. E. Clark (B. & M.), Charlestown, N. H.; E. H. Bryant (N. Y., N. H. & H.), Boston; E. A. Haskell (B. & A.), Springfield, and J. Walker (B. & M.), Nashua, N. H.

Cost of Renewing Sleepers.—The committee consisted of Messrs. A. C. Stickney, M. C. Hamilton and R. A. McQuaid, and they assumed that the renewal of ties in any given piece of track means not only that the decayed and imperfect ties are removed and replaced by sound timber, but that the new ties are thoroughly bar tamped and fully spiked, the ballast filled in and the track left at night in as good condition in every respect as when commenced in the morning, and with old ties piled ready for burning or removal. The cost is from 17 to 21 cents each, varying with the different qualities of ballast, from fine sand to coarse gravel, and also varying with the season of the year. With broken stone ballast it costs 15 to 18 cents to put the tie in and give it the first tamping, but to finish the track with new ties in good surface and line for winter it costs from 30 to 35 cents per tie. To pile old ties costs from one to two cents each.

Messrs. Stickney, J. W. Shanks, Clark, Patch, Coates, Greer, Bryant, Caffery and Haskell participated in the discussion, which resulted in voting "that it is the sense of this convention that 15 cents is a fair price for renewing ties on gravel ballast, and on a double track road with stone ballast 21 cents covers the expense."

Dressing Track.—Messrs. J. M. Torr, L. Curtis and J. W. McNamara constituted the committee to report on the best form of dressing double and single track in gravel ballast. For single track the ballast should be filled to top of tie in center of track, and slope at the rate of three-quarters of an inch to the foot to the end of the tie, thence on a curved slope to a point 18 in. below top of tie and 7 ft. from outside of rail, but in narrow cuts the slope should extend about 2 ft. 6 in. from end of tie. Double track should be dressed in the same manner on the outside, and on inside should slope from top of tie at center of track to a depth of 4 in. below base of rail at the center between tracks.

Mr. W. F. Ellis exhibited large blue prints and diagrams showing the method of dressing track on various roads, including the Boston & Albany, Michigan Central, Pennsylvania and Fitchburg, and he pointed out the differences. For a good-looking track he said the Boston & Albany, with square edge is the best, but work has to be done to get it. For most roads, which do not have much money to spend, he favored the round shoulder as recommended by the committee. Mr. Shanks objected to the square shoulder because it is continually changing at every heavy rain, while the rounded shoulder takes care of itself. Mr. Caffery said ballast should be about 15 ft. wide at the base, and room outside of that for the ditch, with the grass line outside of that. The ditch should be not less than 2 ft. wide, making at least 6 ft. between the rail and the grass line; the general rule is 7 ft., which gives more ballast room. He would keep ballast level for 2 ft. in the center of the track. Mr. Haskell said one advantage of the square edge is that the foreman has a definite line to work from. In rounded edge there is a difficulty in getting the line, for, of course, all shoulders have to be worked up. On the Boston & Albany we cut these shoulders once a year and they stand well; even during last month with its heavy rains, the shoulder as a whole stood well. After further discussion it was voted to amend the report of the committee by providing that the form of a cross-section should be such as will have the gravel level with top of tie, 9 in. each side of center and slope off at the end of tie to 2 in. below the top of tie, the bottom of shoulder to be 2 ft. 6 in. from end of tie and to be rounded, the sub-grade to have a slope of 6 to 1, and sod line to be 7 ft. from rail.

Rail Joints.—The committee, consisting of Messrs. J. W. Shanks, R. Hyland, G. A. DeMore and C. S. Osgood, presented a report, the wording of which was slightly changed and adopted in the following form: We consider that it is necessary to have a base support under the rail ends in order to keep the rail up to a good surface; this base support not to extend below face of tie, and in so doing reduce the expense of keeping the joints up, which is a very important feature in maintenance of tracks. Only two joints, the Weber and Continuous, were submitted for tests; the committee finds both superior to the angle bar, and recommends a joint with base support not extending below the face of the tie. The labor of putting in place, original cost, cost of maintenance and results obtained should be the conditions to be looked into.

Track Tools.—The committee consisted of Messrs. R. P. Collins, F. R. Coates, S. B. Bodwell, Jr., and E. A. Haskell, and the designs submitted were practically the same as those presented at the last convention, the only changes being those necessary to conform to the views of the conventions of previous years. The following dimensions for various tools recommended by the committee were adopted as standards: Lining bar, round point, 5 ft. 1 in. long, weight 16 lbs.; tamping bar, 5 ft. 6 in., 12 lbs. weight; sledge, 7⅛ in. long and weighing 12 lbs.; pinch bar, 5 ft. 1 in; spiking maul, 12½ in. long and 9 lbs. weight; sledge or striking hammer, 5½ in. and 7½ lbs. weight; spike puller, with three knobs and 9½ in. long; track wrench, 2 ft. 6 in. long and 8 lbs. weight; rail fork, 3 ft. 6 in., 10 lbs.; rail tongs, handles, 3 ft. 6 in.; track punch, 8½ in., 3 lbs. weight; track gage, Huntington end, and adapted for wood center to connect other end, which has an offset of 1¾ in. depth of 1 in. to set guard rail with, wood center, 2 × 1½ in.; long track level, 14 ft. wood, and level bob 6 in.; ballast fork, 10 tines with spacing of 1 in., width of fork 10⅞ in.; tamping pick, 2 ft. 3½ in., 9 lbs. weight; clay pick, 1 ft. 1⅞ in., 6 lbs. weight; track center gage, wood shod with iron, 1⅞ in. × 1 in., 6 ft. 10 in. for 100-lb. rail, and 6 ft. 10⅝ in. for 74-lb. rail. The questions of claw bar, raising bar, sledge and adze were referred to special committees of one. The secretary exhibited an iron rod attachment for the track level, designed for laying out shoulders on any desired slope, and he briefly explained its working.

Maintenance of Track.—The committee, Messrs. G. L. R. French, E. H. Bryant and C. B. Lentell, to which was referred the question in what months should the greatest amount of labor be used to get the most value from the yearly total cash allowance per mile of track, reported that, beginning with the 1st of April in the vicinity of Boston, but north and west correspondingly later, a large force can be advantageously employed putting in ties and surfacing track. During April, May and June the conditions are such that more value can be obtained out of every dollar expended than later on, and a reduction can be made in the force on the 1st of July for the rest of the year. Mr. Shanks agreed with the committee if all could get at the work on the 1st of April, but on some sections of his road it cannot be done before the 10th of May. Mr. Coates thought it impossible to always reduce the force on the 1st of July. Mr. Clark said it takes on an average three weeks to a section to clean up the right of way. Mr. Shanks gets through in six or eight days, but he does not rake up the hay; burns it up. President Hyland said some sections on his road can be cleared up in six days, while others take three weeks. After further discussion it was voted as the sense of the convention that during the first three working months after the frost is out of the ground a full force should be employed; the next six months three-fourths of the force and the remainder of the year one-half of the force, except on sections where the work cannot be done, when three-fourths may be employed.

After the discussions the convention adjourned to meet in Boston on August 17, 1898, and the members went in a body to the adjoining room and gave each supply man five minutes in which to explain the merits of his exhibit.

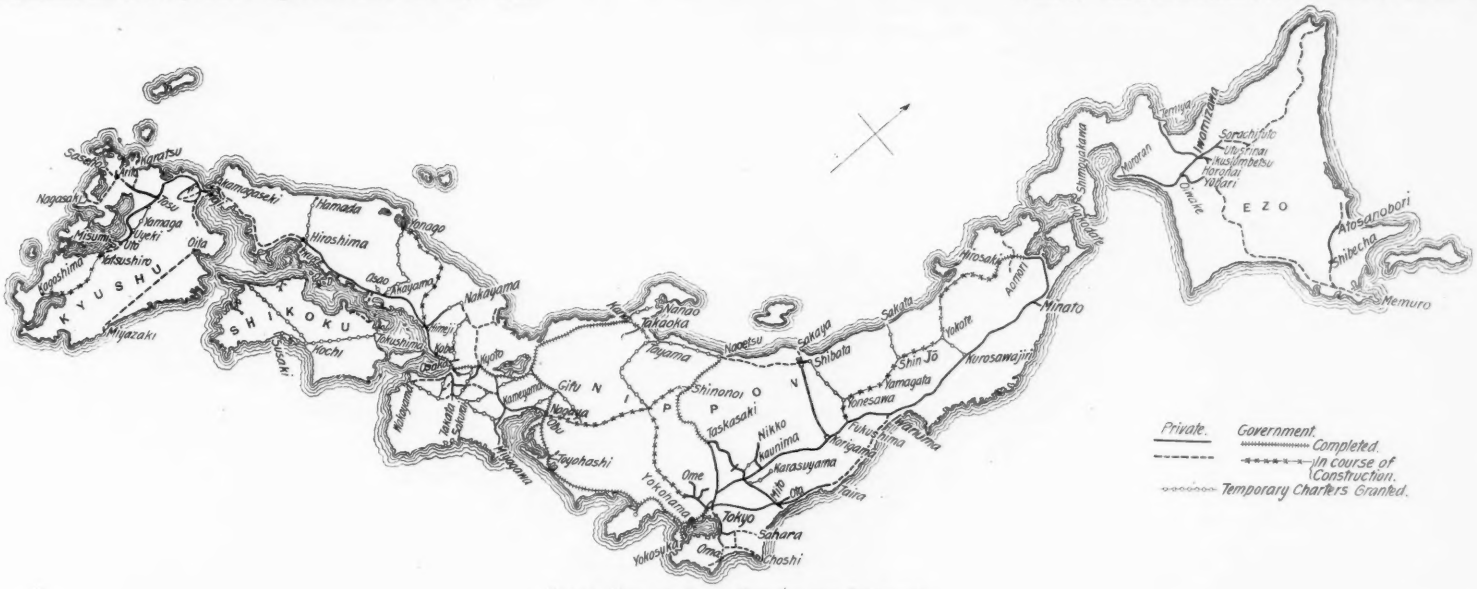
EXHIBITS.

E. C. Boyer, Dayton, O.—Drop track jacks.
Continuous Rail Joint Co. of America, Newark, N J.—Samples of the continuous rail joint.
Dilworth, Porter & Co., Pittsburgh, Pa.—Samples of the Goldie perfect railroad spike and the Goldie claw tie plate.
Elliot Frog & Switch Co., East St. Louis, Ill.—Models of three-throw split switch operated by Hasty stand; frogs, switches, etc.
Eureka Nut Lock Co., Pittsburgh, Pa.—Samples of Eureka nut locks.
Iron City Tool Works (Limited), Pittsburgh, Pa.—Samples of standard track tools.
Kalamazoo Railroad Velocipede & Car Co., Kalamazoo, Mich.—Models of trip and reversing jacks, cattle guards, section cars.
McMullen Woven Wire Fence Co., Chicago, Ill.—Full size samples of railroad fencing.
National Lock Washer Co., Newark, N. J.—Samples of National lock washers.
Pennsylvania Steel Co., Steelton, Pa.—Full size sample anvil face frog.
Pettibone, Mulliken & Co., Chicago, Ill.—Samples Jenne track jack.
Ramapo Iron Works, Hillburn, N. Y.—Model spring rail frog; automatic safety switch and stand.
Roberts, Throp & Co., Three Rivers, Mich.—Models of Cyrus Roberts' hand and push cars; Green safety foot guard; Blue racer cycle inspection car.
Rodger Ballast Car Co., Chicago, Ill.—Models of ballast cars and leveler.
Verona Tool Works, Pittsburgh, Pa.—Samples of nut locks.
Weber Railway Joint Manufacturing Co., New York.—Models of the Weber rail joint.
Wharton Railroad Switch Co., Jenkintown, Pa.—Samples of keyless adjustable rigid frog; automatic switch stand; improved Wharton switch.

Railroad Building in Japan.

The amount of railroad building now going on in Japan is not generally realized. The accompanying map, which has been carefully drawn from late official information, shows the present railroad situation in that country. In addition to the extensions now building, all the existing government lines are being double-tracked. Work on the main line, which extends from Kobe to Tokio, 440 miles, is finished to a point below Baba (about half way between Kobe and Gifu), and to a point 30 miles south from Aomori on the finished part of the Fukushima-Aomori road. Work is progressing rapidly on the other lines. According to the last budget £2,950,033 was set aside for double-tracking the government roads, £500,000 of which is allowed for 1896-97, and the balance in installments ranging from as high as £427,812 down to £66,666, the last installment, to be spent in 1903-04. The question of changing the gage to the standard was discussed, but it was finally decided to stick to the 3-ft. 6-in. gage and provide for a future widening when laying the second tracks by making a wide roadbed.

The budget for 1896-97 includes £1,286,666 for new railroad building in those years and provides for a further expenditure of £5,630,590 up to and including 1903.



Sketch Map of Japan Showing the Railroads.

The most important government line now building is that from Magaya, on the main line, northeast to Shiojiri, and then southeast to Hachioji, with a branch from Shiojiri northeast to Shinonoi. The next in importance is the line from Fukushima, on the line of the Nippon Railway, north to Aomori, the northern terminus of the same road, some 300 miles. The amount allowed for the Fukushima-Aomori line is £1,110,000, or about £3,700 a mile. The other lines include the one extending from the main line and running north to Kana and southeast to Tayama (which is finished to the former point), that from Himegi northwest via Tottori to Yonago, and one in Kyushu from the Yatsushiro south to Kagoshima, with a short piece of road to connect the dockyard at Kure with Hiroshima.

The shops of the Imperial Government Railrways are at Tokio and Kobe. The former were opened 24 and the latter 22 years ago. About 2,500 men are employed. These shops will soon be enlarged to double their present capacity, and new shops will be built about half way between Tokio and Kobe, the exact location not yet having been determined. It is likely that a large part if not all the necessary machinery will be bought in America.

The largest private railroad is the Nippon, which, when built as at present planned, will aggregate about 920 miles. The part shown on the map as building from Taira north to Iwanuma, 100 miles, is about finished, and the short line to Sahara is about half finished. This leaves but three short pieces of road to be built. Work on the extension from Korigama to Sakaya, about 100 miles, has also commenced. Sixty-pound rails and fastenings have been bought from the Carnegie Steel Works for the first 30 miles.

Shops for this road are now being built at Omiya, a junction point about 17 miles northwest of Tokio. They will consist of a number of buildings covering about nine acres of land, but it will be some time, however, before they are finished. For a while nothing but locomotive repairing work will be done. They will eventually be equipped to build and repair both passenger and freight cars, and later may be fitted for building locomotives. About 3,000 men will be employed. The company is also considering building additional shops at another point.

Negotiations are being made to double the capital stock of the road, which is now £3,000,000.

An important piece of work being planned is an elevated structure in Tokio, to connect the Imperial government and Nippon roads, and the building of a Union Station for all the railroads entering Tokio. This, of course, means an interchange of traffic.

The existing and projected roads in Ezo are owned by the Hokkaido Railway & Coal Mining Company, an organization similar to the Philadelphia & Reading. The island is rich in coal.

The rates of fare in Japan are: First class 1½ cent, second class 1 cent, and third class ½-cent a mile. Contrary to the railroads of America, the Japanese roads depend very largely upon their passenger traffic for earnings. Most of the people travel second class.

A Car Heating Patent Decision.

An Interference litigation which has been proceeding for over two years past between Edward E. Gold, of the Gold Car Heating Company, and Robert M. Dixon, of the Safety Car Heating & Lighting Company, has just reached a decision by the Commissioner of Patents on appeal. The original decision of the Patent Office in this case was in favor of Gold, and on appeal by Dixon, the Appeal Board again decided in Gold's favor, as reported in our issue of May 7, 1897.

The invention which was patented to Gold, Nov. 14, 1893, relates to the discharge of condensation water from car heating apparatus, its object being to simultaneously drain all the cars of a train by a single manipulation of a valve. There are four counts or claims in issue. The Commissioner decides that Dixon's drawings in evidence "do not disclose the apparatus of counts three and four of the issue," and awards these to Gold on the record. As to counts one and two, the Commissioner decides that Dixon has proved making of drawings on Jan. 30, 1893, and that this is the earliest date which he has proved with certainty.

According to Dixon's system, the water of condensation was to be discharged by blowing it out at the rear of the train, so that in a train of four cars the water accumulated in all the cars would flow back through the pipe supplying the cars in the rear, and would flow out from that pipe in the rear car. Dixon produced testimony showing that he constructed a full-sized working model which was set up and tested at his company's works during May, 1893, but the Commissioner decides that it does not fully appear that this model illustrated the issues of the Interference, and that it was only an experimental apparatus which was dismantled soon after trial, and no further attempt was made to carry out the idea disclosed therein until several months after the issue of Gold's patent.

During the year 1889 Gold was experimenting with a steam coupling to be used between cars, which was arranged to open and drain the couplings by means of air or vacuum; when this apparatus was being tested Gold remarked to E. H. Gold that the same principle could also be applied to drain the tanks underneath the cars that his company were equipping. "I am led to believe that at this time he had an idea of the invention in controversy and disclosed the principles of the first two counts in this issue." In 1892 Gold's company obtained a contract for equipping the South Side Elevated Railroad in Chicago with a heating system. Gold went to Chicago in January, 1893, and soon after his arrival examined the work on the elevated road and he then proposed to apply pneumatic drainage valves for operating from the locomotive.

The Commissioner decides that Gold disclosed this in-

vention to others on Jan. 10, 1893. He prepared an estimate of cost Jan. 12, and submitted proposals to the company. On his return he disclosed the invention to his attorney, Arthur C. Fraser, who on Jan. 20, 1893, made a sketch and wrote a description thereof. "This documentary evidence in Gold's behalf clearly establishes a date of conception for Gold prior to Dixon's documentary evidence, the drawing of Jan. 30, 1893. Giving Gold a conception of Jan. 10 or 20, 1893, he is prior to Dixon, who has failed to establish any date of conception with certainty prior to Jan. 30, 1893." The Commissioner therefore decides that Gold is the prior inventor.

Dixon attempts to show, however, that he disclosed the invention to David L. Barnes, who disclosed to Gold what information he received from Dixon; but the Commissioner concludes: "From the evidence, therefore, it seems plain to me that Gold is an independent inventor of the matter in controversy: that he conceived it and reduced it to practice prior to the date set up by Dixon."

The effect of this decision is to confirm, so far as it is in the power of the Patent Office, the validity and ownership of the Gold patent. Dixon still has an opportunity of carrying the matter on appeal to the courts, but if the appeal is not entered within 40 days, the decision will become final. It is claimed by the Gold company that, as the prior invention of Mr. Gold has now been upheld by three successive concurrent decisions, an appeal to the courts is improbable, and even if taken, a decision by the court upholding Mr. Gold's right to the patent is a foregone conclusion.

Foreign Railroad Notes.

The Egyptian Delta Light Railways Company has been organized to build 248 miles of lines, chiefly on highways, in the most important provinces of Egypt, having certain guarantees from the government

The Uganda Railroad in British East Africa has been completed for 60 miles from the coast through an extremely unhealthy country, where the dense vegetation was the chief physical obstacle. The cost has been about $15,000 per mile. On reaching the plateau, the work will probably cost fewer lives if not less money.

On June 1 last the rails were laid on the Congo Railroad for a distance of 181 miles, an addition of 62 miles in 12 months. There remained 58 miles to be completed, which it is hoped will be done in another 12 months At the end of June, 1895, 2,841 blacks were engaged on the work; a year later, 3,885, and this year 7,600. The pouring rains which prevail from October to May destroy earthworks not solidly executed. It is reported that the earnings of the road for the 10 months ending with April last were enough to pay not only the working expenses, but 3½ per cent. on the cost of the completed part of the road, which we do not believe.

Next winter a limited train will run between London and Rome by way of the Mt. Cenis Tunnel and Genoa once a week. Heretofore passengers through the Mt. Cenis Tunnel to Rome have usually traveled not by way of Genoa, but by Bologna and Florence. The passengers by this train will leave London at 9 a. m. Monday, Paris at 5:15; arrive at Turin 9:10 a. m. Tuesday, at Genoa 12:30, and at Rome 10:35 p. m. Returning, this train will leave Rome at 8:30 a. m. Thursday, and arrive in Paris at 11:45 a. m. Friday, and in London at 7 p. m. of the same day. There are sleeping cars and dining cars and a good round addition to the regular first-class fare.

The limited train between Vienna and Nice which ran last winter will run daily next winter, and twice a week will run also between Vienna and St. Petersburg.

TECHNICAL.

Manufacturing and Business.

Nat. C. Dean has been appointed Western Representative of the Fox Pressed Steel Equipment Co., with office at Room 1413 Fisher Building, Chicago.

The Allentown Rolling Mills, of Allentown, Pa., are building four large conveyors for the Lehigh Construction Co. for use in excavating 8,000,000 cu. yds. at Massena, N. Y.

Specifications have been sent out by the Imperial Government Railways of Japan for 18,000 tons of track material.

The Interstate Construction Co., of East Orange, N. J., has been incorporated to build and repair railroads, bridges and water works. The capital stock is $125,000 and the incorporators are James Kelly and Bernard Mallen, of New York City; Henry Cleveland, of Brooklyn, and Alfred Lutmann, of Newark, N J.

The works of the Sheffield Car Co., at Three Rivers, Mich., are running night and day and the force has been increased.

Recent orders of the Betts Machine Co., of Wilmington, Del., include a car-wheel boring machine for Kingston, N. Y., one 24 in. slotting machine, weighing 36,000 lbs., for the Maripol Nicopol Metallurgical Mining Co., of Maripol, Russia, and one 12-in. slotting machine for De Fries & Co., of Berlin, Germany, and one 16-ft. mill, weighing 70,000 lbs., for the Crocker-Wheeler Electric Co., of Newark, N. J.

The Massy Railway Supply Co., of Camden, N. J., has been incorporated by James Brennen and Samuel R. Gaytin, of Philadelphia, and Robert B. Hays, of Camden, N. J., to deal in lumber, railroad crossties and bridges. The capital stock is $50,000.

Last week we noted the appointment of P. H. Wilhelm as Agent for the Buckeye coupler. His position is Traveling Sales Agent for Julian L. Yale & Co., 1117 Rookery, Chicago, who are the general sales agents for the Buckeye Malleable Iron & Coupler Co., of Columbus, O., and the Damascus Bronze Co., of Pittsburgh, Pa.

The Meehan Boiler & Construction Co., of Lowellville, O., has recently been incorporated in that state to build steam boilers, iron and steel structural work, water and oil tanks, water towers, railroad cars and appliances, and do a general engineering business. The capital stock is $50,000 and the incorporators are Patrick Meehan, James Meehan, Robert Gray and Porter Watson.

The Frick Co., of Waynesboro, Pa., has received a contract to furnish two 200-ton refrigerator plants for the new packing house of Armour & Co., now being built at South Omaha, Neb.

Bids will be received until Sept. 7 by the Board of Trustees of Jacksonville, Fla., for furnishing all materials and building complete on foundations a steel water tower to be 100 ft high above foundations; the tank on tower to be 30 ft in diameter and 45 ft. high with conical bottom and roof.

Iron and Steel.

On Aug. 17 three furnaces of No. 2 mill of the Brown-Bonnell Iron Co., at Youngstown, O., which has been idle for the past two years, were put in blast. The mill will shortly be running on its full capacity of 50 tons a day.

Stockholders of the Irondale Steel & Iron Co., of Middletown, Ind., have applied for the appointment of a receiver.

The Midvale Foundry Co., Allentown, Pa., will at once put up an addition to its foundry 68 × 109 ft., and will also build a two story pattern shop 50 × 100 ft.

The National Rolling Mill Co., of McKeesport, Pa., has announced that beginning Sept. 1 it will restore the wages of all day employees in force previous to March 16.

The Girard mill of the Union Iron & Steel Co., at Youngstown, O., started up Aug. 25. It has not been working for four years.

On Aug. 17 the Universal and 65-in. plate mills of the Pottstown (Pa.) Iron Co. resumed work, and it is stated that the company has enough orders on hand to keep them busy for over three months. The mills have been idle for a long time pending a settlement of wages.

At a meeting of the creditors of the Valentine Iron Co., of Bellefonte, Pa., Aug. 18, the time for a settlement of outstanding obligations was extended to Jan. 1 next. The iron furnace and ore tanks of the company suspended work Aug. 20 for an indefinite period.

The Crescent Sheet & Tin Plate Co., of Cleveland, O., has given an order to the Leechburg Foundry & Machine Co., of Pittsburgh, Pa., for two 24-in. mills and squaring and doubling shears.

The Natianal Tube Works Co., McKeesport, Pa., has advanced the wages of all employees 10 per cent. This affects over 6,000 men, and restores the amount taken off last March.

The difficulty between the Leechburg Foundry & Machine Co., of Pittsburgh, Pa., and the Reeves Iron Co., of Canal Dover, O., growing out of the use by the latter of a pickling machine claimed to infringe on the Mesta patents, has been settled by the Reeves Iron Co. paying a cash consideration for the court costs and right to continue using the machine.

All departments of the Union Rolling Mill Co., of Cleveland, O., resumed work Aug. 23, after an idleness of almost two months, caused by a scarcity of coal and the men refusing to work until the Amalgamated scale was signed.

The Riverside Iron Works, of Wheeling, W. Va., Aug. 17 put on 200 more men in the pipe mill, and the Wheeling Steel & Iron Co. added 100 puddlers.

The property of the Mill Creek (Pa.) Furnace Co. will be sold at auction at Huntingdon Sept. 3, at 1 p. m.

The annual report of the Colorado Fuel & Iron Co., for the year ending June 30, 1897, shows net earnings of $825,020 and a balance of $280,327, out of which a dividend of four per cent. (amounting to $80,000) was paid in February. The fuel department shows gross earnings amounting to $3,271,740, an increase of $656,004 over the preceding year. The iron department shows gross earnings of $1,539,928, a decrease of $1,228,841. The rolling mills were not working much of the time and the management strongly urges extensive improvements in the iron department. During the year the company obtained a lease upon all the coal mines operated by the Atchison, Topeka & Santa Fe in Colorado, which entailed a large expenditure for improvements and supplies at the mines. The company reports unusually bright prospects for the fuel department for the coming 12 months.

New Stations and Shops.

The new passenger station of the Gulf, Colorado & Santa Fe, at Galveston, Tex., is practically finished, and was used for the first time Aug. 23.

Plans and specifications have been prepared for new shops for the Atlanta & West Point Railroad and Western Railway of Alabama, to be built at Montgomery, to replace those recently burned. They will consist of a machine shop 110 × 100 ft., transfer table 45 × 115 ft., boiler shop 50 × 80 ft., blacksmith shop 50 × 80 ft., and a warehouse 30 × 75 ft.

Plans are being prepared by the Atchison, Topeka & Santa Fe for a combined depot, hotel and office at Las Vegas, N. Mex. Bids have not yet been called for.

The Long Island Railroad is building a freight and passenger station at Great River, a point about five miles east of East Islip. The town is also known as Youngport, but the railroad company has decided to adopt the former name. The passenger station will be a frame building 18 × 20 ft., with shingle roof which will overhang about eight feet. The freight-house will be 13 × 26 ft., with gravel roof. J. E. Van Orden, of Great River, is the contractor.

The West Virginia Central & Pittsburgh is building a 14-stall engine-house at Ridgely, W. Va., a suburb of Cumberland, Md. It will be of brick with steel inside posts and roof trusses and covered with slate. The Edge Moor Bridge Works is furnishing the steel work; H. W. Blocher, of Cumberland, has the contract for the brick work, and Roeder, Heller & Lippold the contract for the masonry work. The building work is boing done by men in the employ of the railroad. Part of the shop will be used for light repairs which have heretofore been made at the West Virginia Central Junction, which shop will be abandoned. A blacksmith shop and boiler-house will be connected with the new shop at Ridgely. The general shops of the company are at Elkins, W. Va.

Test of Armor Plate.

The Ordnance Bureau of the Navy Department on Aug. 16, at Indian Head, tested a sample of 6-in. armor plate made by the Bethlehem Iron Co. for the superstructure of the battleships Kentucky and Kearsarge. Two shots were fired from a 6-in. gun, the projectile being an armor-piercing shell, one at a velocity of 1,462 ft. seconds and the other at 1,675 ft. seconds. Both shells were smashed on the plate, which was neither cracked nor pierced. The armor was approved.

A New Trans-Pacific Record.

The Royal Mail steamship Empress of Japan on her last voyage from Vancouver to Yokohama broke the record for the fastest trans-Pacific trip, her time being 10 days, 3 hours and 39 minutes. The distance covered was 4,270 knots, making the average speed 17.53 knots an hour. The best previous time was made by the Pacific Mail steamship China, from San Francisco to Yokohama, 10 days, 11 hours and 48 minutes.

Cable Conveyors on the Drainage Canal.

In the Proceedings of the Board of Trustees of the Sanitary District of Chicago, published recently, occurs the following: "The Cableway [Lidgerwood] continued work during the month, removing 12,519 cu. yds. in 20½ shifts, an average of 611 cu. yds. per shift." A shift on the Drainage Canal means 10 hours' work. Inasmuch as the Lidgerwood Manufacturing Company, builders of the traveling cableway, have claimed that their cableway is capable of handling 500 cu. yds. a day if fed to the machine, these facts are interesting, showing an average for a month of 611 yds. a day, or 111 cu. yds. per day more than claimed by the builders.

New Dock at Mobile.

The Mobile & Ohio Railroad is building a new dock at Mobile, Ala., which when finished will add the length of two ships to its already spacious docks. The pile-driving and flooring is being done by E. A. Wilson & Co., of Chattanooga, and is to be finished in six weeks. The dredging, which is to be finished in 45 days, is being done by Rittenhouse, Moore & Co., of Mobile. The company will probably build a two-story shed about 500 ft. long and 90 ft. wide on the new pier.

Contracts for Gun Forgings.

On Aug. 18 the Navy Department awarded contracts for furnishing six sets of steel forgings for 6-in. guns and 25 sets for 5-in. guns to the Bethlehem Iron Co., of South Bethleham, Pa., on its bid of 26 cents a pound. The Midvale Steel Co., of Philadelphia, secured the contract for 15 sets for 4-in. guns at 25½ cents a pound.

Bids were opened at the Ordnance Bureau of the War Department Aug. 19 for 79 sets of field gun forgings, the Midvale Steel Co. bidding 32 cents and the Bethlehem Iron Co. 33 cents a pound. For 30 sets of 3½-in. mortar forgings the Midvale Company bid 60 cents and the Bethlehem Company 65 cents a pound.

Bids for Delaware Avenue Improvement, Philadelphia.

The bids were open last Thursday for the bulkhead to be built between Vine and South streets, on Delaware avenue, reference to which was made in our issue of Aug. 13, page 578. There were, in all, 14 bids submitted, the lowest being $430,000 for the entire work. These bids are chiefly interesting as showing at what low rates the concrete blocks, weighing from 35 to 40 tons, can be placed in position in water, and also the wide range of prices for an exceedingly difficult and uncertain piece of work, namely, connecting the new piles to the concrete bulkhead. These range from $1.11 to $30 per linear foot. The contract for the bulkhead requires the contractor to complete the work within 18 months from the date of notice from the Chief Engineer to begin, and the sewer

contracts are to be completed within eight months from the date of notice to begin. Below are given the highest and lowest bids only, showing the wide range of prices in nearly all of the different items:

Bids for entire work.—Bulkhead construction, Delaware avenue, Phila.	Highest bid.	Lowest bid.	Approximate quantities.
Driv. vertical piles, each	14.75	6.55	5,200
Driv. inclined piles, each	18.67	5.60	1,000
Sheet piling, per ft.	20.00	5.00	1,550 ft.
Timber, per 1,000 ft	49.00	26.30	750,000 ft.
Ordnance timber, per ft.	1.00	0.30	2,250 ft.
8-in. granite curb, per ft.	2.00	1.00	5,290 ft.
Concrete blocks, per cu. yd.	18.00	5.51	10,500 cu. yds.
Con. in place, granolithic face, per cu. yd.	10.00	5 15	3,600 cu. yds.
Con. in place, without granolithic face, per cu. yd	9.50	4.00	1,750 cu. yds.
Concrete in bags, per cu. yd.	40.00	5.00	150 cu. yds.
Dredging, per cu yd.	0 45	0.25	145,000 cu. yds.
Rip rap, per cu. yd	2 50	1 00	22,000 cu. yds.
Filling behind bulkhead, per cu. yd	0.55	0.10	239,000 cu. yds.
Gravel filling, selected, per cu. yd	0.75	0 25	176,500 cu. yds.
Removal old bulkhead, per ft.	2 50	0 15	5,450 ft.
Removal solid crib, per sq. ft	2.20	0.06	171,000 sq. ft.
Removal crib on piles, per sq. ft.	1.10	0 06	75,000 sq. ft.
Removal platform on piles, per sq. ft	0.59	0.05	66,000 sq ft.
Connecting new piles to bulkhead, per ft	30.00	1 11	1,900 ft.
New paving, per sq. yd	2 85	1 50	27,500 sq. yds.
Repairing, per sq. yd.	1.00	0.15	1,000 sq yds.
Each pile shoe	3.40	0.79	2,000
Each drainage pipe	15.00	3 60	10
Brick sewer, 3 ft. diameter, per ft.	12 60	4 00	420 ft.
Wooden barrel sewer, 3 ft. diameter, per ft	10.95	5 00	1,090 ft.
Sewer, 4 ft. 9 in. × 7 ft., per ft	30.00	16.00	235 ft.
Sewer, 5 ft. 9 in. × 13 ft., per ft.	54.83	22 50	80 ft.
Steel top for sewer, per ft	48.00	20.50	30 ft.
Con. bottom for sewer, per ft	30 00	3.00	140 ft.
Manholes, each.	100.00	24.00	7

Canvas Head Linings.

The Car Department of the South Side Elevated Railroad (Alley L.), Chicago, has found a use for the old canvas removed from car roofs. When cars needing new ceilings are taken into the shops for general overhauling, instead of putting in a new wood ceiling the old canvas is used for a head lining, the clean side of the canvas being placed outside and painted to conform to the inside furnish of the car. The canvas is put on with large head tacks in such a way as to resemble upholstering, and the cars fitted with the canvas head-linings look well. These canvas linings, complete in place, cost $36 less than the wooden ceilings which have been used exclusively in the South Side Elevated cars heretofore.

A New White Star Line Steamship.

A new freight steamship to be called the Cymric will be launched within a short time by the White Star Line. It was recently stated at the New York office of the company that no details had been received of the dimensions of the new ship, nor information about the service for which it is intended, but it is understood that it will be placed on the New York route.

The New East River Bridge.

We suppose that contracts for the anchorages, the approach spans and the towers for the new East River bridge will be let before many weeks pass. This information is not official, however, and we have no definite statement of the probable date at which bids will be asked for. The anchorages will be let first, then the approach spans; and the towers may be let together or as separate contracts.

THE SCRAP HEAP.

Notes.

The woman arrested at Cleveland for having in her possession counterfeit mileage tickets was sentenced to $500 fine and six months' imprisonment.

W. S. Brand, Superintendent of the Georgia Railway, has been indicted by the grand jury of DeKalb County, Ga., for running freight trains on Sunday. The offense was committed last February.

The Postal Telegraph Co. has taken control of the telegraph lines over the Mexican Central and Mexican National railroads, in accordance with the contract announced several weeks ago. The Postal Company has made a reduction in rates from the Eastern States to the City of Mexico of about 40 per cent, the 10-word message rate from New York being now $1.85.

According to a story in a Western paper, a Section Master of the Union Pacific, Denver & Gulf recently ballasted a few rods of track with gravel which cost $10,000 a carload. Three carloads of rich ore were inadvertently put in the same train with some carloads of cinders and the Section Master, mistakenly assuming that all of the cars were for his use, dumped the gold out on the roadbed.

Railroad Taxation in Utah.

The State Board of Equalization of Utah has reported its valuations upon railroad, telegraph and telephone property for the present year. The total amount is $12,971,404, which is $268,597 less than the previous year. Railroad property proper amounts to about $12,000,000, the remainder being street railroads and telephones.

Railroad Concession in Honduras.

A consular report to the State Department at Washington is authority for the statement that a company "composed largely of New York capitalists" has received from the government of Honduras a concession for the construction of a railroad from Puerto Cortez on the Gulf of Mexico to the Bay of Fonseca on the Pacific Coast, a distance of 150 to 200 miles, with branches. The company will take over the railroad now in operation for 30 miles out of Puerto Cortez, and will receive a subsidy of 3,200 acres of land for each mile of railroad built. The company has already made a guarantee deposit with the government of Honduras and it has guarantees from the government of reasonable import duties on materials.

Our Japanese Visitors.

Within the past year and a half this country has been visited by many Japanese railroad officials, who look to America for modern ideas of building and maintaining railroads. During the past few weeks we have mentioned the presence of no less than seven at one time, two representing the government roads and five the Nippon Railway. Mr. S. K. Hatah, M. E., Chief Mechanical Engineer, and Mr. Masanari Oka, District Traffic Manager of the Imperial Government Railways of Japan, the former with headquarters at Tokio and the latter at Kobe, sailed for Liverpool on the Campania Aug. 21. They will spend a month in England and then go to France and Germany, but are yet undecided as to whether they will go direct to Japan or return via the United States. Mr. J. Y. Mori, Vice-President of the Nippon Railway, reached New York on the Umbria Aug. 21, and will sail from Vancouver for Japan on the Empress of China Sept. 13. He left New York Aug. 24, and will visit Philadelphia, Pittsburgh and Chicago. Mr. Mori's last visit to this country was about 1867, when he entered the Rensselaer Polytechnic Institute, where he studied for about nine years. Mr. S. Awaya, M. E., Engineer of the Locomotive Department, left for England Aug. 4. Mr. S. Hasegawa, M. E., is now in Philadelphia and will probably sail for Europe within a month. Mr. J. Sakurai, Manager of the Purchasing and Stores Departments, is in New York and will also leave for England in a few days. Mr. H. Nagasaki, Foreman of Locomotive Engineers, is also here and will shortly go to Japan via Vancouver. Mr. Y. Kunisawa, Manager of Maintenance of Way, did not come with Mr. Mori, as was expected, but will follow within two or three weeks. All these gentlemen have spoken of many courtesies shown them by American railroad officers. Especially was this true of Mr. Hatah and Mr. Oka, the representatives of the Imperial Government Railways. After an enjoyable trip across the country they were invited by the Brooklyn Heights electric and Long Island roads to take trips over those lines. Mr. Hatah was unable to go on account of illness, but Mr. Oka, the District Traffic Manager, accepted the invitation. The Long Island, through Mr. W. F. Potter, General Superintendent, placed a special engine and private car at his disposal, and the Brooklyn Heights, through Mr. H. Milton Kennedy, General Passenger Agent, a special parlor car. In each case Mr. Oka was given a splendid chance to study heavy local traffic, in which he was particularly interested, having to deal with similar problems in Japan, where there is very little long-distance travel.

Railroad Subsidies in Venezuela.

The Republic of Venezuela has passed a general law authorizing the President to subsidize new railroads at rates varying from $4,000 per 12 miles, where the work of construction is easy, to $12,000, for the same distance, in mountainous country.

Extension of Dorchester Avenue, Boston.

The Massachusetts Harbor and Land Commissioners gave a hearing on Thurday of last week on the petition of the city of Boston for permission to extend Dorchester avenue from First street, South Boston, into the city over a new bridge to be built over Fort Point channel, and past the new Southern Union Station. The location as fixed by the Legislature was opposed by real estate interests affected, on the ground that it not only curtailed the water line of the city and reduced dock privileges, but was a great injury to complainants' property. The Chairman of the Commission intimated that while the act of the legislature gave the board the right to stop the construction of the avenue, it would not feel justified in doing so. The plans will be approved as soon as the grades have been modified by the City Engineer. It was stated at the hearing that President Clark, of the Terminal Company, was still hoping to have the Union Station ready for use on July 1 of next year.

Wheat to South America.

The Bureau of American Republics has received information that merchants of Rio de Janeiro have chartered two vessels now at San Francisco to convey cargoes of California wheat to Rio. This is the first time in history that such a thing has occurred, and is attributable to the short crop in the Argentine Republic and Uruguay.

Chicago City Railway.

It has been rumored for some time that the Chicago City Railway, Chicago, would change the present cable line on the State Street and Cottage Grove lines so as to be worked with electricity, but no action is expected to be taken in the near future, as permission must first be obtained from the City Council and also considerable time would be required to make the change. The indications, however, point to a reduction of the wages of cablemen on the lines named.

On Aug. 10 a card was sent by the railway company to all cable crews stating that a change from cable to electric traction was contemplated, and asking them to state their preference for operating an electric car at 21 cents per hour or a cable train at approximately 23 cents per hour. The cable men are now paid by the trip and receive on good runs as high as $20 per week; by the new rate such men would get about $16 per week, being a reduction in most cases of 20 per cent. Instead of replying to the cards individually the employees held a meeting and conferred with the General Manager and expressed themselves as in favor of the present rates of pay until the change to electricity was made. No action has yet been taken by the company to put the proposed rates into effect.

Railroad Taxes in Montana.

The Montana State Board of Equalization has reported its assessments of railroad property for the current year, the aggregate amount being $13,674.053 as against $10,438,231 in the previous year. The statement shows a gain of 55 miles in length of road during the year, the total now being 2,878 miles. The assessment on the Northern Pacific was increased from $2,835 a mile to $5,100; the Great Northern from $4,000 to $4,600.

The Mashonaland Railroad.

A company has recently been formed in England to build a railroad in South Africa from Beira, a port on the Mozambique Channel, in a general northwesterly direction via Umtali to Ft. Salisbury, in Mashonaland, with a possible extension from the last-named place, southwest toward Buluwayo. It is also proposed to build branches to reach certain gold and coal mining regions. The company's capital stock is £450,000, and it is proposed to issue £900,000 debenture bonds at once, which will be used in building the first portion of the line from Beira to Ft. Salisbury.

LOCOMOTIVE BUILDING.

The Wabash is contemplating buying some new locomotives shortly.

The Imperial Government railroads of Japan are asking bids on 30 locomotives.

It is stated that the Oregon Short Line will build two consolidation locomotives at its Pocatello shops.

The Dickson Locomotive Works have received an order to build two narrow gage engines for San Domingo and one for Russia.

The Denver & Rio Grande has finished building two engines at its Burnham shops. These are similar to the two built for the road by the Baldwin Locomotive Works last year.

The Brooks Locomotive Works expects to finish early in September a large double-end locomotive for the Mexican Central Railroad. This engine will be used for hauling freight trains on steep grades and will be the largest engine the Brooks Locomotive Works has ever built.

The 10 locomotives ordered by the Canadian Pacific from the Baldwin Locomotive Works, as noted in our last issue, will be of the Vauclain compound type and weigh in working order about 116,000 lbs., with 93,000 lbs. on the driving wheels. The boilers and fireboxes will be of steel and the tubes of iron. They will have Westinghouse-American air brakes on driving and tender wheels.

The six 10-wheel locomotives bought by the Kansas City, Pittsburgh & Gulf, and referred to in our last issue, are a part of the order of 55 locomotives contracted for some years ago by the Chicago, Burlington & Quincy Railroad with the Grant Locomotive Works, and before the Grant Works were brought by the Siemens & Halske Co. These engines were designed for either passenger or freight service, and have 62-in. drivers, 19 in. × 24 in. cylinders and straight Belpaire boilers. They were described and illustrated in the *Railroad Gazette* Aug. 30, 1895.

In addition to the six Vauclain compound locomotives recently ordered of the Baldwin Locomotive Works by the Chicago, Milwaukee & St. Paul, an additional order has been given them by the same company for two heavier compound freight locomotives. These engines are of the 10 wheel type with 62-in. driving-wheels and Vauclain compound cylinders, 13 and 23 × 26 in. They will weight about 108,000 lbs. on the driving wheels and have a total weight of about 142,000 lbs. The general features of the engines will be similar to the company's standard freight engines.

CAR BUILDING.

Nelson Morris & Co., of Chicago, are asking bids on 100 refrigerator cars.

It is expected that the Cleveland, Cincinnati, Chicago & St. Louis will shortly buy 1,000 freight cars.

The Northern Pacific is building 100 twin hopper coal cars of 70,000 lbs. capacity at its Tacoma shops.

The Chesapeake & Ohio has sent out plans and specifications for 1,000 box cars, bids for which will close at the end of this week.

The Michigan-Peninsular Car Co. has received an order to build 500 box cars for the Canadian Pacific Railway. They will be of 60,000 lbs. capacity, 35 ft. long, and be equipped with Dunham doors, Washburn couplers, Chicago roofs and Westinghouse air-brakes.

The Ohio Falls Car Mfg. Co., of Jeffersonville, Ind., is building 40 flat cars for James Lawes & Co., of Cincinnati, O., three passenger cars for the Kansas City, Watkins & Gulf Railway, and four passenger cars for the Stillmore Air Line. These are being built after specifications of the car company.

BRIDGE BUILDING.

Belfast, N. Y.—The contract for a 190 ft. span highway bridge at this place has been given to the Havana Bridge Works.

Chicago, Ill.—Plans are being made for a new bridge of the lift type, over the main branch of the river at State street. At the next meeting of the City Council Commissioner of Public Works McGann will apply for an emergency appropriation to cover the cost of the new structure.

Edmonton, B. C.—The contract for the bridge at this place has been awarded to F. Lemoine, of Montreal, at a price of about $36,500.

Framingham, Mass.—Bids are asked Sept. 1 for building a steel plate girder bridge. J. J. Van Valkenburgh, Engineer.

Hartford, Conn.—On Sept. 1 the Railroad Commissioners will give a hearing on the question of a new bridge to be built by the Philadelphia, Reading & New England.

Kilmarnock, Ont.—Mr. Collingwood Scribner, of the Railways and Canal Department, Ottawa, has reported in favor of building a bridge over the Rideau River at this point.

Louisville, Ky.—The contract for the bridge over Beargrass Creek at Kentucky street has been given to Keepers & Thatcher, Detroit, Mich., at $17,000. The other bids received were: Schultz Bridge Co., Pittsburgh, Pa., $17,600; Louisville Bridge & Iron Co., $17,875; Willard & Cornwall, Louisville, $17,925.

Marshville, Ont.—Tenders are asked by H. N. Nelson, care R Cooper, Welland, Ont., for the building of the southern portion of a 120-ft. bridge over the Welland River at Montrose; also for the building of the entire bridge, swing included.

New York.—The Commissioners of the New East River Bridge made a levy of $250,000 each on New York and Brooklyn, on Aug. 19, to meet the expense of building the bridge until Jan. 1. The north caisson on the New York side of the river is now sunk to a depth of about 27 ft., and the soft mud has been removed. The building of the south caisson is progressing slowly. The building of one of the two caissons for the Brooklyn end has been begun.

Bids are asked Sept. 2 for extending Pelham avenue

bridge over the New York & Harlem, and for building a bridge on Brook avenue at the Port Morris Branch Railroad. L. F. Haffen, Commissioner of Street Improvements.

Philadelphia, Pa.—The Pennsylvania Railroad expects to put up its new bridge over the Schuylkill, near Girard avenue, sometime during September. The new span will be built at one side of the present bridge, the intention being to move the two spans laterally until the new structure comes into position. The weight of the new span complete will be about 750 tons, that of old being not over 600 tons.

Pittsburgh, Pa.—On Aug. 12, Director Bigelow reawarded the contracts for three bridges over the Pennsylvania Railroad, part of the cost of which will be paid by the Consolidated Traction Co. The contracts as given are: Penn avenue bridge, to Gustav Kauffman, $12,810; Shady avenue bridge, $13,125, and Highland avenue bridge, $17,975, both to the Schultz Bridge & Iron Co.

St. Joseph, Mo.—The county will build a bridge near here, and bids are asked Sept. 3. Theo. Steinacker, County Surveyor.

Stapleton, S. I.—Bids are asked by the Board of Supervisors of Richmond County, N. Y., until Sept. 8, for the building of two highway bridges. One will be a masonry, steel beam and plank deck bridge over Palmer's Run, near Castleton. The other will be of the same kind, and will be on the Amboy Road, in Westfield. Plans and specifications are on file in the office of the Engineer of County Roads, this place. Franklin C. Vitt, Clerk.

Washington, D. C.—The Chief of Engineers has recommended that the War Department approve the applications of the Vermont Central for permission to build a bridge across Lake Champlain and across the St. Lawrence River, between Cornwall and Hogansport, N. Y.

Waterloo, Md.—The Howard County Commissioners have decided to build a new bridge over Deep Run, on the old Washington road, near here.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Atlantic & Danville, preferred, 1 per cent., payable Sept. 1.

Canadian Pacific, semi-annual, preferred, 2 per cent., and common 1½ per cent.; preferred, payable Oct. 1.

Chicago, Burlington & Quincy, quarterly, 1 per cent., payable Sept. 15.

Philadelphia Traction, 4 per cent., Oct. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Ottawa & Gatineau, annual, for election of directors and other business, Montreal, Sept. 1.

St Louis Southwestern, annual, St. Louis, Oct. 6.

Toledo & Ohio Central, annual, Toledo, Sept. 6.

Toledo, St. Louis & Kansas City, annual, for election of directors, Toledo, Sept. 8.

Metropolitan Traction, to vote on proposition that such corporation be forthwith dissolved, and other business, New York, Sept. 14.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *American Society of Railroad Superintendents* will hold its next meeting at Nashville, Tenn., beginning Sept. 22.

The *American Street Railway Association* will hold its sixteenth annual convention in Convention Hall, Niagara Falls, Oct. 19–22, 1897.

The *Association of Engineers of Virginia* holds its formal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at p. m.

The *Association of Railway Superintendents of Bridges and Buildings* will hold its seventh annual convention at the Brown Palace Hotel, Denver, Col., beginning Oct. 19, 1897.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers and Architects Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 25 East Eighth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

The *Engineers' Club of Columbus*, (*O.*), meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Engineers Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Master Car and Locomotive Painters' Association* will hold its annual convention at Old Point Comfort, Va., Sept. 8, 1897. Robert McKeon, Secretary, Kent, O.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *National Railroad Master Blacksmiths' Association* will hold its annual convention at Chicago Sept. 7.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *Road Masters' Association of America* will hold its annual meeting at Old Point Comfort, Va., Sept. 14 16, 1897.

The *St. Louis Railway Club* holds its regular meeting on the second Friday of each month, at 3 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Traveling Engineers' Association* will hold its annual convention at Chicago Sept. 14.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

New York Railroad Club.

The next meeting of the New York Railroad Club will be held at No. 12 West 31st street, New York, on Thursday, Sept. 16, at eight p. m. Members of the club are requested to communicate with the Secretary, Mr. W. W. Wheatly, suggesting some subject for discussion, during the coming season, which would be of interest and practical value to the members, and also to suggest the name of some person to introduce the subject with a suitable paper.

PERSONAL.

—Mr. Alexander Hogg has been appointed Special Passenger and Advertising Agent of the Texas & Pacific.

—Mr. John G. Robertson, Paymaster of the Central of Georgia, has resigned and will be succeeded by Mr. R. C. Fetzer, Assistant Paymaster.

—Mr. George A. Harris, for nine years Division Freight Agent of the New England, died at his home in Preston, Con., Aug. 22, at the age of 57.

—Mr. John J. Stadiger, formerly a member of the Reorganization Committee of the Denver & Rio Grande, died in Germantown, Pa., Aug. 24, aged 70 years.

—Mr. M. E. Glass has been appointed Traveling Freight and Passenger Agent for the Texas Midland, from Aug. 22, with headquarters at Houston, Tex.

—Mr. W. E. Halm has resigned as General Freight Agent of the Rio Grande Western, and Mr. S. K Henry, Assistant General Freight Agent, will assume his duties.

—Mr. L. F. Eddy has been appointed Contracting Agent of the Detroit, Toledo & Milwaukee, a division of the Detroit & Lima Northern, with headquarters at Toledo, O.

—Mr. A. C. Torbert, Cashier and Paymaster of the Gulf, Colorado & Santa Fe, has been promoted to the position of Secretary and Treasurer, to succeed Mr. John M. Bird, resigned.

—Mr. W. P. Raidler, Master Mechanic and Master Car Builder for the St. Louis & Hannibal, has resigned to accept the position of Master Mechanic of the Green Bay & Western, at Green Bay, Wis.

—Mr. H. Shuffleberger, Division Roadmaster of the Oregon Short Line at Pocatello, Idaho, has resigned. He will be succeeded by Mr. J. McEntee, Timber Inspector of the Union Pacific in Oregon.

—Mr. F. A. Millard has resigned as General Agent of the Freight Department of the Great Northern at St. Paul, Minn., to accept a similar position with the Minneapolis & St. Louis in that city.

—Mr. F. P. Boatman, for several years Superintendent of Motive Power and Master Mechanic of the Omaha & St. Louis, has been appointed Master Mechanic of the Columbus, Sandusky & Hocking.

—Mr. E. W. Jordan, for 15 years Traveling Passenger and Freight Agent for the Chicago, Milwaukee & St. Paul, has been promoted to the position of Live Stock Agent, with headquarters at Chicago.

—Mr. Henry A. Smith, Southeastern Passenger Agent of the Louisville & Nashville at Knoxville, Tenn., has been promoted to the position of Traveling Passenger Agent, with headquarters at Knoxville.

—Mr John M. Bird, for the past nine years Secretary and Treasurer of the Gulf, Colorado & Santa Fe, has resigned. He entered railroad service with this company as clerk in the secretary and treasury department in 1881.

—Mr. J. D. Farrell, formerly General Superintendent of the Great Northern, has been appointed General Superintendent of the Railroad Department of the Oregon Railway & Navigation Co., to succeed Mr. J. P. O'Brien.

—Mr. C. E. Soule, General Superintendent of the Omaha, Kansas City & Eastern, with headquarters at Quincy, Ill., has had his jurisdiction extended over the operating department to include the annexed Omaha & St. Louis.

—Mr. George Washington, formerly Chief Clerk to General Agent Miller, of the Texas & Pacific, has been appointed to the position of Contracting Freight Agent, with headquarters at New Orleans, in place of Mr. T. D. Sadler, resigned.

—Mr. George S. McKee, Master Mechanic of the Cleveland, Cincinnati, Chicago & St. Louis Railway at Mattoon, Ill., has accepted a similar position with the Wabash, with headquarters at Moberly, Mo., to succeed Mr. T. E. Butterly, resigned.

—General R. H. G. Minty, for several years connected with the Southern Pacific offices at Ogden, Utah, has resigned to accept the position of General Freight and Passenger Agent of the United Verde & Pacific, with headquarters at Jerome, A. T.

—Mr. J. J. Campion, for several years General Southern Agent of the Interstate Dispatch Fast Freight, has resigned to accept the position of Traveling Freight Agent for the Cincinnati, Hamilton & Dayton, with headquarters at Cincinnati, O., after Sept. 1.

—Mr. Theodore C. M. Schindler has resigned as General Passenger Agent of the Cincinnati, Jackson & Mackinaw, and his department will be consolidated with the general freight department under Mr. Charles W. Cooke, who becomes General Freight and Passenger Agent.

—Mr. F. O. Melcher, First Assistant Engineer of the Fitchburg, has been promoted to the position of Chief Engineer, with headquarters at Fitchburg, Mass., to succeed Mr. A. S Cheever, who has resigned to become Secretary and Treasurer of a new factory in Cleveland, O.

—Mr. F. W. Huidekoper, for several years President of the Chicago, Peoria & St. Louis, has resigned. Mr. Huidekoper entered railroad service in 1877 as President of the Chicago & Eastern Illinois. For the year following 1881 he was President of the Evansville & Terre Haute. He became First Vice-President of the Richmond & Danville in 1885 and President of the Virginia Midland the year following. From 1889 to 1891 he was President and then Receiver of the Pittsburgh, Shenango & Lake Erie. The year following he became Receiver of the Richmond & Danville, and two years later Receiver of the Georgia Pacific and the Charlotte, Columbia & Augusta road.

—Mr. S. R. Callaway, the new President of the Lake Shore & Michigan Southern, has been in railroad service since 1863, when he entered the employ of the Grand Trunk as junior clerk in the Auditor's office. For two years following 1869 he was Chief Clerk to the Superintendent of the Great Western and for the next three years Private Secretary to the General Manager of the same road. From 1874 to 1878 he was Superintendent of the Detroit & Milwaukee. He then became General Superintendent of the Detroit, Saginaw & Bay City, which position he left in 1881 to become General Manager of the Chicago & Grand Trunk. From 1884 to 1887 he was Second Vice-President and General Manager of the Union Pacific and controlled lines. He then became President of the Toledo, St. Louis & Kansas City, which position he held until January, 1895, when he was made President of the New York, Chicago & St. Louis.

—Mr. Edmund S. Bowen died at his home in New York City on the afternoon of Thursday, Aug. 19. At the time of his death Mr. Bowen was connected with the Ogdensburgh & Lake Champlain Railroad. Mr. Bowen was born at Martinsburg, Pa., in 1831, and began railroad work in 1851, working up through the engineer corps of the Pennsylvania system, becoming in 1864 Resident Engineer on the Northern Central. Later he became General Superintendent and Chief Engineer of the Kansas Pacific, and from 1874 to 1884 was General Superintendent of the Erie. Then he became Vice-President and General Manager of the same road, but retired from active service in October, 1885, as the result of a light stroke of parlysis. This did not disable him permanently, and from September, 1888, to May, 1892, he was General Manager of the Rome, Watertown & Ogdensburg. When this road passed under the ownership of the New York Central, Mr. Bowen became Assistant to the President of the New York & New England and again the vicissitudes of ownership changed his station, and in October, 1893, he became General Manager of the South Carolina & Georgia Railroad. That position he held until June, 1897. Mr. Bowen belonged to the old type of railroaders, a man whose youth had been passed in hard work, with little opportunity for education, and who rose to high rank slowly and steadily by sheer merit. He was a man of great executive force and withal kind, large-minded and generous.

ELECTIONS AND APPOINTMENTS.

Arkansas Central.—The officers and directors of this road, referred to in another column, are as follows: President and General Manager, C. C Godman, Fort Smith, Ark.; Vice-President, Secretary and Treasurer, Joseph H. Larimer, Fort Smith; Directors, C. C. Godman, Joseph H. Larimer, Allen G. Trippur, S. P. Day, Wharton Carnall, all of Fort Smith; V. V. Beavers, Charleston, Ark.; J. S. Shibley, Paris.

Cincinnati Northern.—T. C. M. Schindler, General Passenger Agent, with headquarters at Toledo, has resigned, to take effect Sept. 1. The office of General Passenger Agent will be consolidated with that of General Freight Agent, under C. W. Cook.

Cleveland, Cincinnati, Chicago & St. Louis.—Beginning with Sept. 1, several changes will be made in the Mechanic Department. G. S. McKee, Master Mechanical of the St. Louis Division, with headquarters at Mattoon, Ill., has resigned to accept a similar position with the Wabash, and F. J. Zerbee, Master Mechanic of the Michigan Division, at Wabash, Ind., will be transferred to Mattoon W. T. Orland, of the Cairo Division, at Mt Carmel, Ill., will be transferred to Wabash, and the work of the Cairo Division will be in charge of Mr. Zerbee, being consolidated with the St. Louis Division.

Cotton Belt.—Mr. J. R. Hayden has been appointed Commercial Agent, with headquarters at Waco, Tex Mr. W. G. Palmer has been made Traveling Freight Agent, with headquarters at Fort Worth, Tex., and Mr. T. S. Sleight has received the appointment of Commercial Agent, with headquarters at Sherman, Tex.

Gulf, Colorado & Santa Fe.—A. C. Forbert, Cashier and Paymaster of this road has been elected Secretary and Treasurer to succeed John M. Bird, resigned.

Houston & Texas Central.—J. T. Mahl has been appointed Engineer of Maintenance of Way and Structures, a newly created office, with headquarters at Houston, Tex. The appointment took effect Aug. 10.

International & Great Northern.—At an adjourned meeting of the Directors, held Aug. 13, in the company's offices at Palestine, Tex., the following officers were elected for the ensuing year: President, George J. Gould; First Vice-President, S. H. H. Clark; Second Vice-President, H. B. Kane; Secretary and Treasurer, A. R. Howard; Executive Committee, Edwin Gould, Howard Gould and R. B. Hawley.

The office of Civil Engineer, held by J. D. Trammell, at Palestine, Tex., has been abolished, and the duties of the position will be, merged with those of the Superintendent, George L. Noble.

Lake Shore & Michigan Southern.—The directors of this road met at the Grand Central Station, New York City, Aug. 18, and elected Samuel R. Callaway, formerly President of the New York, Chicago & St. Louis, President of the company, to succeed D. W. Caldwell, deceased.

Montana.—Mr. F. Green, formerly connected with the Missouri Division of the Northern Pacific in North Dakota, has been appointed Superintendent of this road, taking effect Aug. 11. Mr. A. G. Lombard, Chief Engineer, has been given an indefinite leave of absence, and the work of his department will be turned over to Superintendent Green.

Northwestern.—At a meeting in Columbus, O., Aug. 17, of stockholders of this new company, mentioned in another column, officers were elected as follows: President, ex Lieutenant-Governor W. Vance Marius, Bellefontaine, O.; Vice-President, Luther R. Baker, New York; Secretary, W. C. Brown, New York; General Manager, J. T. Adams, Waverly, O.

Oregon Railway & Navigation Co.—Holders of Central Trust Co. voting certificates, representing 71,225 votes in preferred stock and 178,828 votes in common stock, met at New York Aug. 19, and in accordance with the reorganization agreement entered into Feb. 3 (see these columns of Feb 12), nominated directors as follows: By representatives of preferred stock, A. L. Mohler, H. W. Corbett, W. B. Ayer, W. W. Cotton and Wm. McIntosh, of Portland, Ore.; Miles C. Moore, Walla Walla, Wash.; Alfred S. Heidelbach, Wm. M. Bull, Edward D. Adams and Chas H. Coster, of New York. By representatives of common stock, Henry Failing, W. M. Ladd, A. L. Mills, of Portland Or.; W. G. Oakman, of New York, and Samuel Carr, of Boston. The representatives of both classes of stock nominated the Audit Co., of New York, for independent auditors.

Pittsburgh, Bessemer & Lake Erie.—The office of E. H. Utley, General Passenger and Freight Agent, has been removed from Meadville, Pa., to Pittsburgh.

Suffolk & Carolina.—At a recent meeting of the directors George L. Barton was elected General Manager.

Sylvania.—L. H. Hilton, of Syvania, Ga., has been elected President and General Manager of this road to succeed J. F. Lovett. The office of Secretary and Treasurer, heretofore consolidated with that of President, has been given to G. M. Hill.

At a recent meeting of the stockholders the following officers were elected: President, L. H. Hilton, Sylvania, Ga.; Secretary, G. M. Hill; Treasurer, U. H. McLaws, Savannah.

Union Pacific.—The headquarters of T. A. Davies, Master Mechanic, have been removed from Laramie, Wyo., to Ogden, Utah.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Arkansas Central.—This company, a notice of whose incorporation appeared in this column May 7, has begun building its line from Fort Smith, Ark., to Paris, 44 miles. The company expects to have the construction train running to Charleston, 25 miles, by Oct. 1, and to the end of the line a month later. The names of the officers and directors will be found in another column.

Atchison, Topeka & Santa Fe.—About 66 miles of new 75-lb. rails, it is reported, are being laid between Lexington Junction and Marceline, Mo., on the Chicago Division. When these rails are laid the entire main line from Kansas City to Chicago will be equipped with new rails, except the section of 115 miles between Marceline and Fort Madison, Ill., where the track is comparatively new.

Buffalo, Rochester & Pittsburgh.—Extensive improvements in the line of this road are being planned at Falls Creek, Pa. The line over the hill by Grove Summit is to be replaced by a section 5⅓ miles long, which will run near the tracks of the Pennsylvania line to Lanes Mills. This will reduce the distance by 3¼ miles and somewhat reduce the grade. The contract for grading has been let to the Ferguson Construction Co., of New York, and the stone work to Smith & McCormick, of Easton, Pa. Another similar improvement is being made between Whistletown and Johnsonburg.

Canadian Pacific.—This company has entered upon the building of seven miles of road to replace the old line between Mono and Orangeville, Ont. The proposed line runs on the old roadbed of the Toronto, Grey & Bruce to Englewood Junction. The road now in use has very steep grades and will be abandoned when the new one is completed. It is reported that engineers are surveying a line from Robeson, B. C., south to connect with the old survey from Rossland to the Columbia River.

Carthage.—Several hundred convicts have been at work for some time grading the extension of this road from Carthage, N. C., about 12 miles to Island Ford. It is expected that track-laying will begin Sept. 1. The present road runs from Cameron, N. C., west and southwest via Carthage to Curriersville, 21 miles. W. C. Petty, Cameron, N. C., is lessee and General Manager.

Chicago, Burlington & Quincy.—This company is reported to have engineers out surveying for a connecting link from Lead City, S. Dak., southwest about 50 miles to Newcastle, Wyo.

Colorado & Northwestern.—A contract has been let to Ormand & Crook, of Pueblo, Colo., for building this road (also known as the Inter Mountain see this column for June 11). It is projected to run from Boulder, Colo., northeast, 26 miles, to Ward and Spring Gulch. The officers and directors are given in another column.

Detroit & Mackinac.—Work has begun on an extension of this line from La Roche, Mich., northwest toward Mackinaw. About 20 miles, running through Presque Isle County, will be completed this fall, which carries the road through a fine belt of hardwood timber. In this section there will be five curves with a maximum of one degree. This maximum grade against the traffic will be 16 ft. to the mile.

Erie & Central New York.—The G. F. Mellen Co., of New York City, has the contract for building this road, which runs from Cortland, N. Y., southeast, through McGrawville, Solon and Freetown to Cincinnattus, 16½ miles. The materials for building are on the ground, and the work is progressing rapidly.

Florida, Alabama & Northern.—This company has been incorporated in Alabama to build a lumber railroad from Elba, Coffee County, Ala., southwest, about 125 miles to Pensacola, Fla. By permission of the Secretary of State of Alabama, the company opened its books for subscriptions in May (see this column for May 7), and about 20 per cent. of the $50,000 authorized capital is reported to have been paid in. The company expects to begin work at once. W. B. Wright and J. J. Sullivan, of Florida, are among the promoters.

Fonda, Johnstown & Gloversville.—This company is reported to have closed a contract with the Lackawanna Iron & Steel Co., of Scranton, Pa., for 13 miles of 70-lb. rails. The heavy rails now extend from Fonda to a point a short distance above Gloversville. The money to make these improvements comes from the new $700,000 refunding loan referred to in these columns July 23.

Galveston, Brazos & Southwestern.—The contract for building the first seven miles of this road is reported to have been let and work begun near Fairwood, Tex. This road as projected is to run from Fairwood, west, via Angleton, Columbia, and Hardeman, to Bay City, Tex., 65 miles.

Galveston Terminal Railway & Warehouse Co.—This company has been incorporated at Austin, Tex., with a capital of $50,000 to own and operate a terminal railroad, warehouses, etc., in the city of Galveston. The incorporators are J. Lobet, J. H. Langbehn and John D. Fearhake.

Grain Belt.—This company has been incorporated in Colorado with $50,000 capital to build a line from Hooper, Colo., a point on the Denver & Rio Grande, west about 13 miles into the grain belt of the San Luis Valley. The directors are J. M. Warden, J. L. Hurt, J. O. Abrams, E. Worth, M. M. Suttley and J. W. Mills.

Great Northern.—Work has been begun on the Cascade tunnel in Washington. The east approach has been completed and tunnel excavation commenced. The west approach has not yet reached solid rock. Mr. Willard Beahan, formerly with Anderson & Barr, has been engaged as Superintendent of Construction. This tunnel will be about 2¼ miles long and is expected to cost $2,000,000. It will require at least two years to build it.

Kansas & Southeastern.—This company has been chartered in Topeka, Kan., to build a road from a point on the St. Louis, Kansas & Southwestern, at or near South Haven, southwest across the Kansas state line to Parker, Oklahoma., 18½ miles. The headquarters of the company are at Arkansas City, Kan. The Directors are Francis S. Eaton, A. W. Brown, Chas. L. Brown and Chas. F. Leach, of Arkansas City, and G. H. Whitcomb, of Topeka, Kan.

Kennebec & Farmington.—This company has been organized to build a narrow gage road from Augusta, northwest about 25 miles, to New Sharon, Me.

Lake Manitoba.—Work is nearly completed on the extension of this line to Lake Winnipegosis, in Manitoba. The road now extends from Gladstone Junction, a station on the Northern Pacific, northwest about 100 miles to Sifton, passing through Dauphin.

Mobile, Jackson & Kansas City.—The first section of 30 miles from Mobile to Dog River has been completed. The contract has been awarded to C. D. Smith & Co., of Birmingham, Ala., for the section of 22 miles, which will extend the line as far as Pascaguola River, calling for its completion by Dec. 1. The road as projected is to run from Mobile, Ala., to Jackson, Miss., 180 miles.

New York & Ottawa.—Contracts have been let by this company for building its bridge across the St. Lawrence at Cornwall. The contractors are: For grading, Messrs. Pepard & Balch, of Minneapolis, Minn.; for rails, Johnson & Co., Johnstown, Pa.; masonry, Sooysmith & Co., New York; ironwork, Phœnix Bridge Co., Phœnixville, Pa. This company proposes ultimately to connect New York and Ottawa by railroad. Because of certain legal requirements it has been found necessary to incorporate 10 district companies, all under the control of the same Board of Managers. The company, which was incorporated in New Jersey July 6, as noted in this column July 9, is to have charge of building the whole line. When completed the road will be bonded for not more than $15,000 a mile, including the bridge over the St. Lawrence. The company has acquired the Northern New York, which runs from Tupper Lake north to Moira, N. Y., 54 miles. It is also seeking to obtain the road running from Moira to Bombay. If it is successful, the road will run from Bombay to a point on the St. Lawrence, opposite Cornwall, and after crossing the bridge will run as direct as possible from Cornwall to Ottawa, the whole distance being about 74 miles. It is intended to push the work of building as rapidly as possible.

Northwestern.—This company, whose incorporation was noted under the name of Columbus & Worthington in this column Aug. 13, proposes to build a railroad from Columbus, O., northwest through Franklin, Union, Logan, Anglaize and Mercer counties to the Indiana state line. New York capital is said to be back of the enterprise and it is proposed that work begin immediately. The names of the officers are given in another column.

Ohio River & Charleston.—The extension of this road from Blacksburg, S. C., southwest to Gaffney, about 10 miles, is expected to be completed by Sept. 15. The company has decided to continue the line southwest to Spartanburg, S. C., via Clifton and Glendale, about 20 miles. It is announced that another extension will be made this fall to Sumter, S. C. Arrangements are being made by the company to bond its property for $600 000, after which the intention is to build the long-talked-of extension from Marion, N. C., northwest about 80 miles, to Johnston City, Tenn., a point on the Southern. The main line runs from Camden, S. C., northwest to Marion, N. C., 172 3 miles. The company also has a line from Ellison's Mills, Tenn., to North Carolina state line, 32.3 miles. It was reorganized in 1894, having been previously known as the Charleston, Cincinnati & Chicago.

Palmetto & Gulf.—This company has been chartered to build a railroad from Palmetto, La., on the Texas & Pacific, south through St. St. Langrave Parish, St. Martinville and New Iberia, to Vermilion Bay, about 75 miles.

Richmond, Petersburgh & Carolina.—Work was begun on this road Aug. 18 at Ridgeway, N. C., the southern terminus of the line, and the intention is to push on without delay to Petersburgh and Richmond. The company was chartered some years ago to build a line from Richmond, Va., south to Ridgeway, N. C., about 100 miles. About 20 miles of the road have been graded just out from Petersburgh and piers for a bridge have been built on the Roanoke River in North Carolina.

St. Louis, Peoria & Northern.—Work was begun July 1 on the extension of this road from Springfield north to Peoria, Ill., 60 miles. The extension runs through Sherman, Middletown, New Holland, San Jose, Green Valley and Pekin. It is expected that the extension will be completed by Nov. 1. The J. A. Ware Construction Co., of Springfield, O., has the contract for the earthwork. Burnet & Lutos, of St. Louis, have the contract for the timber and the Phœnix Bridge Co., of Phœnixville, Pa., for steel bridges. The road now runs from Glen Carbon, 14 miles from St. Louis, north 84.5 miles to Springfield. Trains run from St. Louis to Glen Carbon over the tracks of the Chicago, Peoria & St. Louis.

Stone Mountain.—A contract has been made with the North Carolina State Penitentiary for the employment of several hundred convicts to grade this road (see this column for March 26) from Roaring River, Wilkes County, a point on the North Carolina, northwest about 18 miles to Stone Mountain. The contract calls for the delivery of the men within 40 days. Later it is proposed to extend the line from Stone Mountain northwest about 15 miles to Bristol, Tenn. George W. Hinshaw, Winston, N. C., is President of the company.

Valdosta, Ga.—It is reported that President J. M. Wilkinson has disposed of all the bonds of this road and that steps will be taken at once for its completion. The road, as projected a number of years ago, was to run from Valdosta, Ga., south 27 miles, to Madison, 12 miles of which, from Valdosta, were built. All the stock is owned in Valdosta.

Electric Railroad Construction.

Attleboro, Mass.—The Norton & Attleboro Street Railway Co. has been incorporated, with a capital of $40.000. The Treasurer is E. D. Hewins and the Directors Franklin Mead, D. A. Brooks, A. H. Sweet, George L. Wetherell, George H. Lovejoy and G. P. Talbot. The line will run from the New York, New Haven & Hartford Railroad station in Attleboro to the Library square in Norton, 5½ miles.

Bangor, Me.—The rails have arrived for the extension of the Bangor, Hampden & Winterport Electric Railroad, and work will be begun immediately on the line from East Hampden to Hampden Lower Corner and Winterport.

Braddock, Pa.—The Covey Avenue Street Railway Co., capital stock $10.000, has been granted a charter to build a road in Braddock.

Charleston, S. C.—The City Railway Co. is pushing the work on the suburban line to Chicora Park. Improvements are being made along the route and a large passenger traffic is expected to result therefrom.

Chicago, Ill.—The Suburban Railroad Co. completed nearly a mile of track in the village of Riverside in less than 13 hours last week. An injunction has restrained the company from building this portion of the road, and the hasty work was done in order to prevent any further delays in its construction.

Cleveland.—The Cleveland, Berea & Elyria Railroad Co. has applied for a franchise to build a line from its Lorain street track to Linndale. It is proposed to complete this branch with a year.

Duke Center, Pa.—A line is proposed to run from the Olean, Rock City & Bradford Road, at Knapp's Creek, to Duke Center, and an effort is being made at the latter place to raise $25,000 to build the line.

Exeter, Ont.—Local capitalists are promoting an electric road from Grand Bend to St. Mary's. The plan includes a station for the general distribution of power.

Far Rockaway (L. I.), N. Y.—The State Railroad Commissioners have approved the application of the Ocean Electric Railway Co. to build to Far Rockaway. One of the conditions of the application as granted is that the road shall not be built at grade across the Long Island Railroad at Hollywood and Carnaga avenues.

Gainesville, Ga.—An electric street railroad company was granted a charter last week to build and operate a 25-mile line in Gainesville and to the White Sulphur Springs, seven miles east of that place.

Kankakee, Ill.—Right of way is being secured for the projected Kankakee, Wilmington & Morris electric road, which it is proposed to build through Kankakee, Wilmington and Morris to the Braidwood coal mines, making the entire length about 50 miles.

Lexington, Mass.—The Lexington Street Railway Co., mentioned in these columns a few weeks since, has prepared its articles of organization, and on Tuesday of this week applied for locations in Woburn, Arlington and Lexington.

New Britain, Conn.—The third rail electric road between New Britain and Berlin has been completed, and cars were placed in regular service last week.

New Brunswick, N. J.—The following contracts have been let for building the electric line of the Brunswick Traction Co., from New Brunswick to Bound Brook and Metuchen: For excavating the road to P. H. Rehill, Jersey City; for macadamizing the road from New Brunswick to Metuchen to V. D. Pierce, Metuchen; for overhead wires, rails and iron work to McElroy & Cartney, New York. The company has applied to the Perth Amboy Board of Aldermen for a franchise for an electric road to be built in that city.

New York.—The State Railroad Commissioners have granted the application of the Second Avenue Railroad Co. for permission to change its motive power to electricity and to arrange for the installation of electric conduits. Permission to tear up the streets for that purpose has not been asked for as yet.

Port Richmond, (S. I.), N. Y.—The Staten Island Electric Railroad Co., has completed its branch from Port Richmond to Bull's Head, and the road was formally opened on Saturday of last week.

Saco, Me.—The Saco River Electric Railroad Co. has been granted permission to build its proposed new road through North and Elm streets, Saco. It is possible that the road will be running between Biddeford and Bonny Eagle by December.

St. Thomas, Ont.—Negotiations are still going on between the City Council and the promoters of the proposed electric street railroad. The Council has decided to obtain a proper estimate of the probable cost of the proposed railroad before agreeing to guarantee the bonds of the company to the amount of $50,000.

Springfield, Mass.—The Southwestern Electric Street Railroad has determined on its route into the town of Agawan, and the grading is nearly completed from the Massachusetts line to Suffield Center. The work is now in progress from the latter place to West Suffield.

Titusville, Pa.—The Titusville Electric Traction Co. has filed a bond for $2,500 as a guarantee to complete its lines in Titusville within one year from the date of accepting the franchise granted by the city.

Westbrook, Me.—It is proposed to build an electric road passing through Gorham, Windham, Raymond, Casco and Naples, Me., the entire length to be about 30 miles.

West New Brighton (S.I.), N. Y.—The application of the Midland Railroad for a franchise from Richmond along the Fresh Kills road, through Rossville to Tottenville, has been considered by the Highway Commission. The conditions agreed upon between the electric railroad company and the Commission provided for the commencement of the work within one year, and its completion within three years. It also provides for not less than 24 daily trips and a bond from the company of $2,500 for the fulfillment of the contract.

Wichita, Kan.—The City Council has passed an ordinance granting the Wichita Railway, Light and Power Co. a franchise. The city will require the company to pay 2½ per cent. on all gross earnings in excess of $50,000 a year, and also require the cars to be run at least 16 hours each day at a speed not to exceed eight miles an hour in the city limits.

GENERAL RAILROAD NEWS

Baltimore & Ohio.—J. P. Morgan & Co. have received official notice that the coupons of the five per cent loan of 1927 on the Chicago division ($6,690,048 outstanding), due June 1, but now in default, will be paid on or before Oct. 1.

Bangor & Aroostook.—This company reports for the three months ended June 30, 1897, gross earnings of $179,370; operating expenses, including taxes, $115,597; making the net earnings $63,773. The fixed charges amount to $70,906, leaving a deficit for the quarter of $7,133. The officials estimate that with the new Limestone extension and the improved business conditions the gross earnings will be at least $100,000 more for the fiscal year ending June 30, 1898, than for the year just closed.

Chesapeake & Ohio.—This company announces that it has exercised its option to retire the $296,000 Buckingham Railroad bonds of 1892 in exchange for an equal amount of its own 4½ per cent. mortgage bonds of 1892. Interest will cease on bonds not presented for exchange.

Chicago & Western Indiana.—The trustees of the first mortgage bonds have designated by lot 87 of these bonds, aggregating $87,000, dated Nov. 1, 1879, which by the condition of issue are to be redeemed at 105 by J. P. Morgan & Co., New York.

Colorado Midland.—At a meeting of holders of the Busk Tunnel bonds ($1,250,000 outstanding) held in London, Aug. 4, Messrs. A. E. Hambo, J. A. Bryce, Lachlan Young and Rowe were appointed a committee to protect their interests. By a decree of the United States Court the sale of this road is advertised to take place at Colorado City, Col., Sept. 8, at 12 noon. The properties covered by each mortgage are to be sold separately, and then as a whole.

Delaware River & Lancaster.—A. H. Wintersteen, of Philadelphia, Master of this road, announces the postponement of the sale from Aug. 24 until Tuesday, Sept. 14, to be held at noon, in Westchester, Pa. The road is 12 miles long and extends from French Creek Junction to a point near St. Peters, all in Chester County, Pa.

Evansville & Richmond.—Suit has been filed in the Jackson, Ind., Circuit Court against this company and the Farmers' Loan & Trust Co. of New York, to collect delinquent taxes amounting to over $5,000 and asking for the appointment of a receiver. This road, which extends from Elnora, Ind., east to Westport, 101.4 miles, was sold under foreclosure at Washington, Ind., March 23, to the Farmers' Loan & Trust Co.

Grand Trunk.—A mortgage to secure an issue of $500,000 of bonds has been given to the Washington Trust Co., of New York, by the Detroit & Pontiac, whose line forms the eastern end of the Detroit, Grand Haven & Milwaukee division of the Grand Trunk. The mortgage covers all the real estate, franchises, tracks and other property of the company. The bonds are to be 25-year $1,000 gold bonds, with interest at five per cent., payable semi-annually. Of the total $300,000 will be issued at once and the balance as needed upon vote of a majority of the stockholders. The proceeds are to be used to pay debts and to make various improvements between Birmingham and Pontiac, Mich.

Kansas City, Watkins & Gulf.—At the request of holders of a considerable amount of bonds of this company, Wm. H. Male Doeshbaugh, President of the New England Land & Trust Co., and T. G. Strong, of New York, have consented to act as their Reorganization Committee and to prepare plans for such reorganization.

Mexican Central.—The earnings for the six months ended June 30 were reported as follows:

Six Months:	1897.	1896.	Inc or Dec.
Gross earn. (Mex. cur.)	$6,567,754	$4,835,788	I. $1,731,966
Oper. expen. (Mex. cur.)	4,276,237	3,121,412	I. 1,234,825
Net earn. (Mex. cur.)	$2,191,517	$1,714,376	I. $477,141
Average rate per Mex. cur.	49.90 cts.	54 22 cts.	D. 4.32 cts.
Net earn. (U. S. cur.)	$1,093,613	$9 9,555	I. $161,058
Other increase (U. S. cur.)	10,520	18,319	D. 7,799
Total (U. S. cur.)	$1,104,133	$947,874	I. $156,259
Interest on bonds (U. S. cur.)	1,189,300	1,155,094	D. 34,206
Deficit (U. S. cur.)	$85,167	$207,220	D. $122,053

The net interest on the subsidy trust fund for the six months of 1897 was $103,158, from which the $85 167 deficit in the operations of the road being substracted, leaves a surplus for the period of $17,991. On July 1 the total investment to secure interest on the mortgage bonds was $9,315,220.

New England.—The earnings for the quarter and for the 12 months ended June 30 were reported as follows:

Three Months:	1897.	1896.	Inc. or Dec.
Gross earn	$1,376,294	$1,390,696	D. $14,332
Oper. expen	936,376	1,012,496	D. 76,120
Net earn	$439,918	$378,139	I. $61,788
Other income	69,096	5,451	I. 63,645
Total income	$509,014	$383,591	I. $125,433
Charges	398,686	376,827	I. 21,859
Surplus	$110,328	$6,754	I. $103,574
Year:			
Gross earn	$5,231,649	$5,955,742	D. $704,093
Oper. expen.	3,997,872	4,274,015	D. 276,143
Net earn	$1,253,777	$1,681,727	D. $427,950
Other income	81,799	18,728	I. 63,071
Total income	$1,335,576	$1,700,455	D. $364,879
Charges	1,571,257	1,577,849	D. 6,592
Surplus	(def.) $235,681	$122,606	D. $358,287

The percentage of operating expenses (including improvements and extraordinary repairs) to gross earnings for the fiscal year 1897 was 76.2 against 71.8 for 1896.

Northern Central.—The earnings for the seven months ended July 31 were as follows:

Seven months:	1897.	1896.	Inc. or Dec.
Gross earn	$3,574,088	$3,448,792	I. $125,296
Oper. expen	2,595,620	2,680,087	D. 84,467
Net earn	$978,468	$768,705	I. $209,763

Oregon Improvement.—Judge Morrow ordered a decree of foreclosure and sale of the property of this company in the United States Circuit Court at San Francisco Aug. 24, in the case of the Farmers' Loan & Trust Co., trustees of the first and second mortgages, aggregating $10,500,000. A similar decree was entered by Judge Hanford in the United States Circuit Court at Seattle, Wash. For a fuller account of the finances of this company see this column for Aug. 20.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The earnings for July and for the seven months ended July 31 were reported as follows:

July:	1897.	1896.	Inc. or Dec.
Gross earn	$1,171,244	$1,248,499	D. $77,255
Oper. expen	789,039	832,610	D. 43,571
Net earn	$382,205	$415,889	D. $33,684
Fixed charges	227,145	256,417	D. 29,272
Surplus	$155,060	$159,472	D. $4,412
Seven months:			
Gross earn	$8,009,417	$8,498,897	D. $489,480
Oper. expen	5,814,299	6,449,131	D. 634 832
Net earn	$2,195,118	$2,049,766	I. $145,352
Fixed charges	1,841,908	1,916 528	D. 74,620
Surplus	$353,210	$133 238	I. $219.972

Union Pacific, Lincoln & Colorado.—The committee, under the bondholders' agreement of April 5, Charles E. Cotting, Chairman, announces an extension of the time to Oct. 1 for deposits of the first mortgage bonds with the Old Colony Trust Co., Boston, or the Guarantee Trust Co., New York (see this column for April 16). These are 30-year five per cent. gold bonds, $4,380 000 outstanding. The road extends from Salina to Oakley, Kan., 225.4 miles. Of the $2,309,800 capital stock $1,997,800 is owned by the Union Pacific, which guarantees the interest and principal of the bonds. No interest payments have been made on the bonds since October, 1893.

Electric Railroad News.

Brooklyn, N. Y.—The annual reports for the year ending June 30, 1897, of the Brooklyn Heights R. R. Co. and the Brooklyn, Queens County & Suburban R. R. Co., compared with the previous fiscal year are given as follows:

Brooklyn Heights Railroad Co.:	1897.	1896.
Gross earn	$4,392,298	$4,272,393
Oper. expen	2,617,738	2 503,226
Net earn	$1,774,560	$1,769 167
Income, other sources	238,298	232,600
Gross income	$2 012,858	$2,001,767
Taxes and fixed charges	1 900,365	2,044.875
Balance surplus	$112,493	
" deficit		$43,102

[About $22,000 of expenses on account of track rentals, etc., which were last year charged into fixed charges are this year charged into operating expenses, thereby increasing the latter and decreasing the former as compared with a year ago.]

Brooklyn, Queens County & Suburban:	1897.	1896.
Gross earn	$730,977	$684 946
Oper. expen	437,502	451,130
Net earn	$292.775	$233,816
Income, other sources	9 382	18,017
Gross income	$302 157	$251,833
Taxes and fixed charges	357,273	345,561
Balance, deficit	$55,116	$93.728

The Brooklyn Rapid Transit Co. owns the capital stock of the Brooklyn Heights, and Brooklyn, Queens County & Suburban railroads, and has outstanding bonds of $5,511,000, leaving $1,489,000 still in the treasury. The Brooklyn Heights Co. contributes over $160,000 a year toward meeting the interest on these bonds, this amount being the interest on the money advanced for construction work to the Heights Company from the Rapid Transit Co., and being included in the Heights Company's fixed charges, as stated above. In addition the Brooklyn Rapid Transit Co. receives over $100,000 a year in interest upon securities held and funds invested, and is entitled to all the surplus profits of the two operating companies.

London, Ont.—The extension of the electric railway to Pottersburg has been decided upon.

McKeesport, Pa.—The Youghiogheny Traction Co. has secured control of the lines of the Versailles Traction Co., between McKeesport and Boston Bridge for $85,000. The Versailles line is 3¼ miles long. The Youghiogheny Traction line will extend to Buena Vista and West Newton, making, with the Versailles line, a road 15 miles in length.

New York.—A meeting of the stockholders of the Metropolitan Traction Co. will be held on Sept. 14 for the purpose of voting on a proposition to dissolve the corporation, it being the intention of the company to unite the present stock with that of the Metropolitan Street Railway Co. The latter company formerly operated the road, while the Traction Company simply held $6,000,000 of the total $30,000,000 of stock of the Metropolitan Street Railway Co.

Philadelphia.—Assistant General Manager E. H. Schaufler and Superintendent of Rolling Stock William H. Wampler, of the Union Traction Co., have resigned their positions to take effect on Sept. 1.

Williamsport, Pa.—An agreement has been entered into between the Williamsport Passenger Railroad and the Montoursville Trolley Co., whereby the two lines will connect at the eastern limit of the city, and the cars of the latter will run over the tracks of the former.

TRAFFIC.

Traffic Notes.

The Ohio Central has restored passenger trains 21 and 24, which were taken off some weeks ago on account of the coal strike.

The Chicago Great Western has issued circulars at Omaha announcing that the company will furnish ice free for refrigerator cars which are loaded with dairy products.

The Louisville & Nashville last week ran an excursion from New Orleans to Louisville and back at a round trip rate of $10, including stop overs at Nashville and at the Mammoth Cave. There were more than two trainloads.

The season of the two express steamers of the Great Northern Railroad running from Buffalo to Duluth closes Sept. 11. These ships have done a better business than in any preceding year, and have at times been actually crowded with passengers. On one trip recently the North West carried 800 passengers between ports.

Freight movement is now heavy on all roads carrying grain. The movement of loaded cars over the Erie through Salamanca on Aug. 14 was 1,865 cars, and for the following 24 hours 1,806 cars. Over the Baltimore & Ohio the average eastbound daily movement from Grafton during the first 10 days of August was 1,123 loaded cars. The Grand Rapids & Indiana and the Chicago & West Michigan are both short of cars in Michigan. The Vandalia now has all its power that is in order for service employed, the first time in three years. Freight crews on the Louisville division of the Pennsylvania lines are now making better time than at any time since 1892. Transfer yards in and around Pittsburgh are crowded, though an important branch of their business, coal, is now very light on account of the strike.

Chicago Traffic Matters.

CHICAGO, Aug. 25, 1897.

The Western Passenger Association officials have been having a lot of trouble with the Rice Lake, Dallas & Menominie Railway, which, it seems, has been issuing tickets to scalp the market. It has issued a quantity of tickets which had every indication of having been cut and put on the market for scalping purposes. Well-posted general passenger agents, who supposed they knew every road in the country where a passenger could be corraled, gave it up when asked to locate the R. L., D. & M. Finally Chairman Caldwell looked in the Official Guide and found that it was an affair 8 miles long somewhere up in Wisconsin, really nothing more than a logging road. M. P. Barry is General Manager and Superintendent, and M. P. Barry is General Traffic Manager. Mr. Caldwell entered into correspondence with Barry, and finding traces of a scalping scheme but getting no satisfaction, sent a man up into the woods to see him: and a conclusion was arrived at whereby the Rice Lake, Dallas & Menominie will issue no more tickets over Eastern roads.

The Chicago, Rock Island & Pacific and the Chicago, Milwaukee & St. Paul have made an arrangement for interchange of freight traffic at Omaha, very similar to that now existing between the Chicago & Northwestern and the Union Pacific. By it the St. Paul road at Omaha will give all its unconsigned westbound freight to the Rock Island. It is contemplated establishing on Oct. 1 a new through tourist car line between San Francisco and Pittsburgh, over the Pennsylvania, the St. Paul, the Rock Island, the Colorado Midland, the Rio Grande Western and the Southern Pacific. Beginning Sept. 12, the St. Paul road will run a daily first-class sleeping car between Chicago and Denver, over its own line to Omaha and from that city to Denver over the Rock Island.

Interchangeable mileage tickets continue to be a lively topic of discussion. The sub-committee which reported in favor of the Sebastian ticket has been discharged, and a new committee appointed to report upon the various kinds of interchangeable mileage tickets.

The new Western lines freight agreement submitted to the Presidents for adoption some time ago will probably go into effect on Sept. 1.

The Atchison, Topeka & Santa Fe, after a hearing before the Kansas State Railroad Commissioners, has made the following reductions:

On agricultural implements, from Kansas City to Lyons, Chase and Mitchell, Kan., five cents per 100 lbs.; on coal from common points to Chase, 10 cents a ton; grain, from Chase, Lyons and Mitchell, one cent a bushel to Chicago, Kansas City and Galveston.

Passenger rates between Chicago and St. Paul are in a critical condition. The market is largely in the hands of the brokers, and they are making rates to suit themselves.

Eastbound shipments from Chicago and Chicago junctions to points at and beyond the Western termini of the trunk lines for the week ending Aug. 19 amounted to 61,281 tons, as compared with 57,116 tons the preceding week. This statement includes 25,704 tons of grain, 2,397 tons of flour and 12,052 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

Roads.	Week Ending Aug. 19.		Week Ending Aug. 12.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	1,714	2.8	2,918	5.1
C., C., C. & St. Louis	3,004	4 9	1,523	2.7
Erie	7,614	12.4	7,584	13.3
Grand Trunk	7,829	12 8	5,841	10.2
L. S. & M. S.	8,008	13.1	8,429	14.8
Michigan Central	17,624	28.8	13,656	23 9
N. Y., Chi. & St. L.	2,080	3.4	2,516	4.4
Pitts., Cin., Chi. & St. Louis	4,062	6 6	3,517	6.1
Pitts., Ft. Wayne & Chicago	5,668	9.2	5,774	10.1
Wabash	3,678	6.	5,358	9.4
Totals	61,281	100.0	57,116	100.0

Lake shipments last week were 161,730 tons.